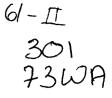
Steven N. Goldstein and Walter J. Moberg, Jr.



# Wastewater Treatment Systems for Rural Communities

Commission on Rural Water Washington, D.C. 1973



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iv

Walter J. Moberg, Jr. is a student of Architecture and Urban Planning at Princeton University. He joined the research and writing effort during summer employment, bearing principal responsibility for the catalogue of equipment available (Appendix C). He continues to serve as a consultant to NDWP.

# Foreword

This book is a guide to systems and components available for treating wastewaters in rural areas.

It should assist designers and planners of wastewater treatment facilities for rural communities in laying out preliminary system plans including significant cost components. Similarly, it should provide the potential client (a water and wastewater district, for example) with sufficient information on available alternatives to enable him to exercise an informed choice among those presented by the consulting engineer for his consideration.

In addition, it is intended that this book show government agencies, such as environmental and public health regulatory bodies, agencies committed to economic development and social transition, loan guarantors, and legislative bodies, that a range of alternatives does indeed exist for providing effective wastewater treatment in isolated areas at reasonable cost. This information should also be of value to the home-building and home improvement industries as well as individual rural homeowners faced with the problem of providing waste disposal and treatment facilities for their families.

This book begins with a chapter on basic concepts of domestic sewage and treatment processes appropriate to rural settings. In Chapter Two, the role and use of soils in wastewater treatment and disposal are described.

The third chapter reviews traditional systems and design approaches for wastewater treatment systems. New or unusual methods for wastewater collection and conveyance and treatment and disposal where the traditional approaches are not appropriate are described in Chapter Four.

Included are specially engineered above-ground mounds and subsurface soil disposal systems for use when the native soil is not suitable for accepting settled sewage; composite systems in which sewage is either ground up at the house or settled in modified septic tanks and pumped under pressure in small diameter sewers to a central treatment facility; spreading of treated sewage effluent on the surface of the land by spray irrigation; and the use of treated wastewater as a resource for fire protection.

# vi Foreword

Chapter Five describes the traditionally poor record of maintenance and service of small plants and suggests types of management organization that can provide proper plant maintenance and service. Some basic information about the characteristics of septage, the material pumped from septic tanks, is also included in Chapter Five. This information should be useful in the design of facilities for the safe treatment and disposal of this often overlooked residual of on-site treatment.

The final chapter provides a basis for anticipating the costs of components and systems for treating wastewater in rural communities. Because many of the design approaches discussed in this book represent departures from traditional methods, there has not been sufficient experience upon which to base reliable cost estimating procedures for several of them.

Three appendices are included. Appendix A, an original contribution by Alfred P. Bernhart of the University of Toronto, presents a rational approach for determining building lot sizes on the basis of soil suitability for wastewater disposal. Appendix B reviews the role of the National Sanitation Foundation in testing the performance of appropriately sized components of wastewater treatment systems for rural communities.

Appendix C contains a representative selection of equipment which can be used in rural (and suburban, for that matter) wastewater treatment systems. Illustrations and data sheets abstracted from manufacturer-supplied information are organized along functional lines (e.g., collection and conveyance, treatment, disposal). (New or revised equipment data sheets will be provided in future revisions or supplements.) Appendix C also contains an index of manufacturers whose equipment appears in this book.

Over one hundred manufacturers were contacted to obtain the information presented in Appendix C. About seventy replied, and about fifty offered the details requested. Several of the units included in Appendix C are so new that finished brochures are not yet available. A few are used abroad (in Sweden and Japan, for example), but have not yet been introduced into the American market. Many units illustrated are departures from the usual approach to wastewater treatment and should therefore be of interest to a wide readership.

The authors received considerable assistance from many individuals in writing this book. William H. Bender, recently retired Assistant Director for Soil Survey Interpretations, Soil Conservation Service, U.S. Department of Agriculture (USDA) collaborated with the authors in writing the sections about the fundamentals of soils in relation to wastewater disposal. John T. Winneberger, private consultant, of Berkeley, California; the late E. E. MacNamara of Lehigh University, Bethlehem, Pennsylvania; and W. J. Meyer, Soil Scientist, Virginia State Department of Health, Richmond, Virginia, all made valuable contributions to the material on soils. As indicated previously, Alfred P. Bernhart of the University of Toronto made a substantial contribution to this book.

The authors are also grateful to the individuals named in the summary data sheets in Appendix C and the companies which they represent for their cooperation and the materials they supplied.

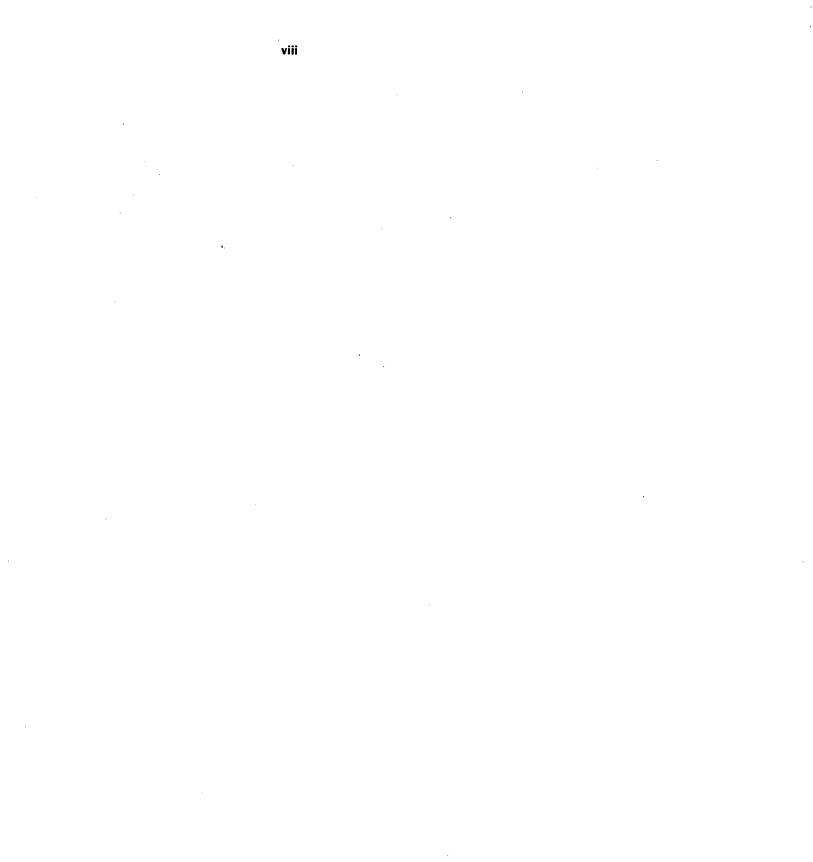
# vii Foreword

Numerous graphic exhibits, including all of Appendix C, first appeared in a report written by the authors for National Demonstration Water Project (NDWP) while they were on the staff of the MITRE Corp. The authors express their appreciation to the MITRE Corp. for the loan of the original copies of graphic materials.

The authors' colleagues on the Commission on Rural Water have provided encouragement and invaluable assistance in the task of reviewing earlier versions of this book. Judith A. Segal of the Office of Economic Opportunity and Michael D. Campbell, Director of the National Water Well Association's Research Facility in Columbus, Ohio, deserve special recognition for their contributions. The authors also wish to thank Stanley Zimmerman, Executive Director of NDWP, for his assistance in this regard.

In conclusion, the authors happily acknowledge the contributions to this book of the editor, Shirley True, and the designer, James True. The transformation of the manuscript into a finished book was a most satisfying experience for the authors as a result of their close association with the Trues during the production process. The collaborative effort permitted, for example, the creative use of marginal spaces and coordination of the text and visual exhibits.

Steven N. Goldstein Walter J. Moberg, Jr. Bethesda, Maryland Princeton, New Jersey January, 1973



# Contents

#### Foreword

Tables

**Figures** 

#### Abbreviations

# Chapter One: A Primer on Small Sewage Treatment Systems, 1

Scope of the Problem, 1 The Nature of Domestic Sewage, 2 The Sewage Treatment Process, 2 **Biochemical Oxygen Demand**, 2 Levels of Treatment, 3 More About Microorganisms, 4 Coliforms and Contamination, 5 Aerobic and Anaerobic Treatment in Individual Home Systems, 5 On-Site Treatment, 6 Septic Tanks, 6 Aerobic Tanks, 6 Factors to Consider in Selecting an On-Site Treatment System, 6 Treatment Processes in Small Community Treatment Systems, 7 Lagoons, 7 Imhoff Tanks, 7 Activated Sludge Processes, 7 Trickling Filters, 8 Physical-Chemical Sewage Treatment, 8 Chapter Two: The Role of Soils in Wastewater Disposal, 9 Soil Characteristics Relevant to the Application of Wastewater, 9 The Soil Profile, 10 Movement of Wastewater in Soils, 14 The Use of Soils in Wastewater Systems, 18 General Principles for Applying Wastewater to Soil Absorption Systems, 18

The Use of Soil Surveys in Planning Systems, 19

Soil Factors that Affect Subsurface Absorption Fields, 20

#### Contents

The Role of Evapotranspiration in Subsurface Absorption Systems, 24 Soil Factors that Affect Sewage Lagoons, 26

### Chapter Three: Traditional Approaches to Wastewater Systems Design, 30

General Planning and Design Criteria, 30 Functions of Sewage Works, 30 Collection and Conveyance of Wastewater, 31 Treatment, 31 Disinfection, 33 Disposal, 34 Self-contained Systems, 35 Basis for Estimating System Size, 35 Sizing of System Components, 43 Traditional Systems Design, 44 Water Carriage Systems, 45 On-Site Wastewater Systems, 45 The Soil Absorption System, 47 Centralized Community Wastewater Treatment Systems, 52

#### Chapter Four: Alternate Approaches to Wastewater Systems Design, 57

Above-ground Mounds for Disposal of Effluent, 57
General Design Criteria, 58
Specialized Designs, 61
Specially Engineered Subsurface Soil Absorption Systems, 62
Composite Systems Using Pressure Sewers, 66
Basic Design Concepts, 66
Design Parameters, 67
Land Spreading by Spray Irrigation, 69
General Concepts, 69
Area Requirements, 71
System Components and Layout, 73
The Use of Treated Wastewater as a Resource for Fire Protection, 75

#### Chapter Five: Operation of Rural Wastewater Systems, 79

Maintenance and Service, 79 Septic Tank Systems, 79 Aerobic Systems, 80 Package Plants, 81 Management Organizations, 82 Disposal of Septage, 84 Properties of Septage, 84 Volumes of Septage, 86 Incremental Cost of Treating Septage, 87

# Chapter Six: Costs of Wastewater Treatment Systems, 88

Introduction, 88 Costs of Central Systems, 88

# Contents

An Estimate of Sewer Construction Costs In Rural Areas, 92 Costs of Package Plants, 93 Costs of On-Site Systems, 93 Cost Comparisons — Annualization, 93

### Appendices, 97

Introduction to Appendix A, 97

**Appendix A:** A Rational Approach to Determining Sizes of Building Lots According to Their Capabilities for On-Site Wastewater Treatment and Disposal. By Alfred P. Bernhart, 100

- **Appendix B:** Performance Standards and the National Sanitation Foundation, *128* Introduction, *128* 
  - Wastewater Technology Program at the National Sanitation Foundation, 128

**Appendix C:** Survey of available Equipment and Equipment Data Sheets, 132 Introduction, 132

Self-contained Systems, 133

Wastewater Collection and Conveyance Subsystems, 138

Septic Tanks and Septic Tank Accessories, 152

Individual Home Aerobic Treatment Units, 166

Package Treatment Plants, 200

Aeration Devices, 238

**Disinfection Devices**, 260

Disposal of Treated Wastewater, 274

Water Consumption Reduction Techniques, 294

Accessories, 306

Index of Manufacturers, 324

# References, 329

**Recommended for Further Information**, 332

Index, 333

xi

# Tables

- **1** Soil Limitation Ratings for Septic Tank Absorption Fields, 22
- 2 How to Estimate Assist From Evapotranspiration, 27
- 3 Soil Limitation Ratings for Sewage Lagoons, 29
- 4 Estimated Distribution of Sewage Flows, 36
- **5** Sewage Flow From Country Clubs, 36
- 6 Sewage Flow at Public Parks, 36
- 7 Quantities of Sewage Flows, 37
- 8 Sewage Flow Rate Estimating Guide, 38
- 9 Package Treatment Plant Sizing Data, 39
- **10** Suggested Daily Flows and BOD Considerations, 42
- **11** Guide for Determining When to Pump Out a Septic Tank, *46*
- 12 Guide for Estimating Loading Rates of Soil Absorption Systems, 50
- **13** Comparison of Process Parameters for Conventional Activated Sludge Process, Contact Stabilization Modification, and Extended Aeration Modification, 55
- 14 Lagoon Surface Area for 1,000 Population Equivalent, 73
- 15 Estimated Peak Domestic and Firefighting Demands on a Small Water Supply System, 76
- **16** Total Four-Hour Fire Flow Needs and Number of Days' Accumulation of Treated Wastewater Required, 77
- **17** Physical-Chemical Properties of Septage, 85
- **18** Estimated per Capita Initial and Annual Costs of Waste Treatment System Components for Various Community Sizes, 89
- 19 Construction Costs and Lengths of Sewers for Various Community Sizes, 91
- **20** Preliminary Sewer Construction Cost Estimates, 92
- 21 Preliminary Additive Cost Estimates for Sewer Construction, 92
- 22 Annualization Factor, 95
- **23** Water Flow Reduction Estimates, 235

# **Figures**

- **1** Growth of public waste-handling services, **3**
- 2 Guide for USDA Soil Textural Classification, 11
- **3** Percolation test hole with other test holes properly distributed over the field in the background, *17*
- 4 Soil map, Montgomery County, Md., 20
- 5 Soil map of an area in the Piedmont region, 21
- 6 Average annual lake evaporation for the forty-eight contiguous states, 26
- 7 Sewage treatment processes generally available to rural communities, 31
- 8 Top view and cross section of above-ground mound, 58
- 9 Design standards for the Evapotranspiration (Mound) Sewage Disposal System, 59
- 10 Mound system over slowly permeable soils within three feet of soil surface, 61
- 11 Mound system over creviced bedrock within three feet of soil surface, 62
- **12** Gopher mound for clay soil, 63
- **13** Gopher mound for sandy soil, 64
- 14 Hancor inverted channel air-flow system, 65
- 15 Hancor Bio-vent™ system (bed design), 65
- 16 Hancor Bio-vent<sup>™</sup> system (trench design), 66
- 17 Schematic diagram of spray irrigation of treated effluent, 69
- **18** BOD design curve for septage, 85
- **19** Total solids design curve for septage, 86
- 20 Per capita construction costs of various collections and treatment system components, 90
- **21** Per capita cost of primary sedimentation plants, 90
- 22 Per capita cost of activated sludge plants, 91
- 23 Per capita cost of trickling filter plants, 91
- 24 Main sewage sampling manifold and programmable sampling station, 130
- 25 Several individual home aerobic wastewater treatment plants undergoing performance testing, 130
- 26 Activated sludge package treatment plant and chemical tablet chlorinator being tested, 131
- 27 Wastewater test evaluation laboratory, 131
- 28 Septic tanks: general shapes, 153
- **29** Septic tanks: two designs, *154*



xiv

# Abbreviations

| ABS             | acrylonitrite-butadiene-styrene plastics         |  |  |  |  |
|-----------------|--------------------------------------------------|--|--|--|--|
| AC              | alternating current                              |  |  |  |  |
| AGA             | American Gas Association                         |  |  |  |  |
| AGMA            | American Gear Manufacturers Association          |  |  |  |  |
| amp             | ampere                                           |  |  |  |  |
| ASA             | American Standards Association                   |  |  |  |  |
| ASCE            | American Society of Civil Engineers              |  |  |  |  |
| ASSE            | American Society of Sanitary Engineering         |  |  |  |  |
| ASTM            | American Society for Testing and Materials       |  |  |  |  |
| AWC             | available water capacity                         |  |  |  |  |
| BHP             | brake horsepower                                 |  |  |  |  |
| BOD             | biochemical oxygen demand                        |  |  |  |  |
| BODs            | biochemical oxygen demand over a five day period |  |  |  |  |
| ca              | circa (approximately)                            |  |  |  |  |
| CFD             | cubic feet per day                               |  |  |  |  |
| CFM             | cubic feet per minute                            |  |  |  |  |
| CGA             | Canadian Gas Association                         |  |  |  |  |
| Cl <sub>2</sub> | chlorine                                         |  |  |  |  |
| cs              | Commercial Standard                              |  |  |  |  |
| DC              | direct current                                   |  |  |  |  |
| DO              | dissolved oxygen                                 |  |  |  |  |
| E. coli         | Escherichia coli                                 |  |  |  |  |
| FA              | free air                                         |  |  |  |  |
| FAA             | Federal Aviation Administration                  |  |  |  |  |
| FHA             | Federal Housing Administration                   |  |  |  |  |
| FmHA            | Farmers Home Administration                      |  |  |  |  |
| FOB             | free on board                                    |  |  |  |  |
| fps             | foot (feet) per second                           |  |  |  |  |

# Abbreviations

| g/cm³<br>GPCD<br>gpd<br>gph<br>gpm | grams per cubic centimeter<br>gallons per capita per day<br>gallons per day<br>gallons per hour<br>gallons per minute |  |  |  |  |  |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|
| hp                                 | horsepower                                                                                                            |  |  |  |  |  |
| Hz                                 | <sub>ini.</sub> Hertz                                                                                                 |  |  |  |  |  |
| ID                                 | inside diameter                                                                                                       |  |  |  |  |  |
| IPS                                | iron pipe size                                                                                                        |  |  |  |  |  |
| IPT                                | internal pipe thread                                                                                                  |  |  |  |  |  |
| Kwh                                | Kilowatt hour                                                                                                         |  |  |  |  |  |
| Ib.                                | pound(s)                                                                                                              |  |  |  |  |  |
| LP                                 | liquid propane (gas)                                                                                                  |  |  |  |  |  |
| mg/l                               | milligrams per liter                                                                                                  |  |  |  |  |  |
| ml                                 | milliliter                                                                                                            |  |  |  |  |  |
| MLSS                               | mixed liquor suspended solids                                                                                         |  |  |  |  |  |
| mm                                 | millimeter                                                                                                            |  |  |  |  |  |
| mph                                | miles per hour                                                                                                        |  |  |  |  |  |
| MPN                                | most probable number (usually expressed as number per hundred milliliters)                                            |  |  |  |  |  |
| NA                                 | not applicable                                                                                                        |  |  |  |  |  |
| NAS                                | National Association of Sanitarians                                                                                   |  |  |  |  |  |
| NEC                                | National Electrical Code                                                                                              |  |  |  |  |  |
| NEMA                               | National Electrical Manufacturers Association                                                                         |  |  |  |  |  |
| NPS                                | normal pipe size                                                                                                      |  |  |  |  |  |
| NPT                                | national taper pipe thread                                                                                            |  |  |  |  |  |
| NRC                                | National Research Council                                                                                             |  |  |  |  |  |
| NSF                                | National Sanitation Foundation                                                                                        |  |  |  |  |  |
| NWS                                | National Weather Service                                                                                              |  |  |  |  |  |
| OD                                 | outside diameter                                                                                                      |  |  |  |  |  |
| ph                                 | phase                                                                                                                 |  |  |  |  |  |
| PPD                                | pounds per day                                                                                                        |  |  |  |  |  |
| ppm                                | parts per million                                                                                                     |  |  |  |  |  |
| PSI                                | pounds per square inch                                                                                                |  |  |  |  |  |
| PSIG                               | gauge pressure in pounds per square inch                                                                              |  |  |  |  |  |
| PVC                                | polyvinylchloride (plastic or resin)                                                                                  |  |  |  |  |  |
| RPM                                | revolutions per minute                                                                                                |  |  |  |  |  |

# Abbreviations

xvii

| SCFM  | standard cubic feet per minute                              |
|-------|-------------------------------------------------------------|
| SG    | specific gravity                                            |
| TDH   | total dynamic head                                          |
| т.о.  | threshold odor                                              |
| TSS   | tertiary suspended solids                                   |
| USASI | United States of America Standards Institute                |
| USFS  | United States Forest Service                                |
| USPHS | United States Public Health Service                         |
| USWB  | United States Weather Bureau (now National Weather Service) |
| v     | volt                                                        |
| VA    | Veterans Administration                                     |
| W     | watt                                                        |
| W.C.  | water column                                                |

•



# A Primer on Small Sewage Treatment Systems

Scope of the Problem Urban sewage treatment plants are simple in concept, but they are quite complex in their hardware and special engineering is generally provided. Rural modes of waste management, on the other hand, are complex in concept, but so simple in their hardware that special engineering is rarely needed. For rural needs, hardware is managed by simple codes or prefabrications.

In many places, a rural home has a pressurized water system and its own sewer with a complete treatment plant and disposal arrangement. This is usually the septic tank system. In some cases, more sophisticated treatment units replace the septic tank, but still utilize a customary subsurface disposal field.

Sometimes in rural areas, several homes are served by a community sewer which may either terminate at the nearest water course or at a scaled-down version of a municipal treatment plant, commonly referred to as the package plant. Package plants are often unreliable in operation and wastewater treatment is frequently incomplete even when they do operate properly. Water quality control boards are demanding better treatment. In many places, disposal to water courses has been forbidden.

Some rural homes do not have pressurized water systems. In such instances, a pit privy provides a relatively complete system, which in practice constitutes an excellent device. Rather than a pit privy, sometimes disposal of human waste can be managed by incineration or other sophisticated techniques.

Maintenance in rural situations is generally not provided, and the life of almost any wastewater management system will be prematurely terminated by a combination of poor design and near total neglect.

Historical trends in the availability and quality of wastewater treatment are illustrated in Figure 1. About 70 per cent of the population was served by sewers in 1968. Of these, about 92 per cent had waste treatment facilities. The 30 per cent of the population not served by sewers depended on some fifteen to seventeen million septic tank and cess-

#### A Primer on Small Sewage Treatment Systems

pool installations, and five to ten million households used more primitive techniques such as privies or direct discharge to watercourses.

This book addresses the unsewered 30 per cent or so of the present population and the choices available for treatment of domestic wastes. Future populations and the type of sewerage services they will need are also of concern.\*

The Nature of Sewage from individual homes is a complex brew—it consists of all manner of things that go down drains or are flushed down toilets. The composition of sewage varies from day to day, from house to house, even from hour to hour. On the average, domestic sewage consists of about 99.9 per cent water (weight) and 0.02 to 0.03 per cent suspended solids and other soluble organic and inorganic substances. [1†] Sewage also contains bacteria, viruses, and other microorganisms from the digestive tract, respiratory tract, and skin, which make their way to toilets and drains.

In a single family house, the laundry and kitchen each account for about 10 per cent of the wastewater volume, while the bathtub, shower, and handwash basins account for about 40 per cent, and the toilets account for the remaining 40 per cent. [2] The organic chemical content of domestic sewage comes primarily from human wastes, soaps, and food wastes (especially in homes where a garbage grinder is used).

The Sewage Set Treatment Process

2

Sewage treatment has as its goals:

(1) The removal of solids;

(2) The stabilization of organic oxygen-demanding compounds;

(3) The killing of disease-causing microorganisms; and

(4) The removal of other harmful chemical substances and disagreeable colors and odors.

#### **Biochemical Oxygen Demand (BOD)**

The amount of treatment required before effluent can be discharged (the "strength" of the sewage) is the amount of the various materials present which must be removed. One measure of the amount of organic material present is the biochemical oxygen demand (BOD), which is the total amount of oxygen utilized by microorganisms in converting wastes to more or less fully oxidized end-products called stabilized sewage. If sewage is only partially broken down, i.e., not fully stabilized, it will later require more oxygen from its environment to complete the oxidation process.

\* For the corresponding problem of water supply, see Michael D. Campbell and Jay H. Lehr, Rural Water Systems Planning and Engineering Guide, Commission on Rural Water, Washington, D.C., 1973.

<sup>†</sup>Numbers in brackets refer to References at the end of the book.

#### A Primer on Small Sewage Treatment Systems



190 180 170 U. S. POPULATION 160 150 140 130 SN 120 NOSH3110 110 UNSEWERED POPULATION 5 100 MILLIONS 90 80 70 WITHOUT TREATMENT 60 POPULATION 50 40 PRIMARY A INTERMEDIATE 30 SEWERED TREATMENT 20 SECONDARY TREATMENT 10 1940 1950 1960 1968

Source: Economics of Clean Water, Vol. 1. U.S. Dept. of the Interior, Federal Pollution Control Administration, March 1970, p. 75.

The most common way a BOD measurement is made is by diluting a sample of sewage with water containing a known amount of dissolved oxygen and incubating the mixture in a tightly sealed bottle for five days at 20°C (68°F). The amount of oxygen used during the five days is determined by measuring the amount remaining and subtracting it from the starting amount. This type of BOD determination is referred to as a  $BOD_{5}$ , indicating the five-day process. It accounts for about 80 per cent of the oxygen used in the oxidation process which, of course, may take more than five days. Often the non-specific term BOD is used, and more often than not it denotes the five-day (BOD<sub>5</sub>) value. Typical values of BOD for raw domestic sewage are several hundred milligrams per liter  $(mg/l^*)$ .

# Levels of Treatment

3

The terms *primary*, secondary, and *tertiary* usually refer to the level of treatment provided by a system. These systems typically use sewers to collect and convey wastewater from homes to centralized plants which treat the sewage.

The removal of settleable solids is a physical procedure which can be done with screens and gravitational settling. This part of the treatment process is often called primary treatment.

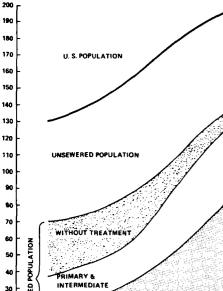
Intermediate treatment is the removal of a high percentage of suspended solids and a substantial percentage of colloidal matter, but little dissolved matter. A significant amount (25 to 35 per cent) of the BOD is removed in primary and intermediate treatment because it is tied up in the solids which are removed.

Secondary treatment is the reduction of BOD through biological digestion of the sewage (including dissolved organic substances) to yield stabilized sewage (effluent). The success of secondary treatment is absolutely dependent on the maintenance of an active culture of microorganisms which feed on the sewage and stabilize it as a consequence of their metabolic processes.

The removal of organic and inorganic compounds not removed in primary or secondary treatment is accomplished by a number of different processes and is collectively referred to as tertiary treatment, also called advanced wastewater treatment (AWT).

Chlorination is often used to meet goal (3) of the sewage treatment process, the killing of disease-causing microorganisms, but it doesn't always work. The inadequacy of chlorination arises in part from improper adjustment of equipment and insufficient maintenance and in part from the resistance of microorganisms. Other methods such as irradiation with ionizing radiation (ultraviolet, radioactive isotopes), use of ozone, and pasteurization are beginning to be used.

\*Roughly equivalent to parts per million (ppm).



#### A Primer on Small Sewage Treatment Systems

More About Microorganisms Microorganisms (microbes) are important both as constituents of sewage and as digesters of sewage. Biological wastewater treatment systems are designed to promote and protect microbial growths to accelerate the decomposition of waste products.

Microorganisms include the algae, which are either single cells or aggregations of similar cells, or more complex structures in which the cells are specialized. Algae are not constituents of sewage, but they grow in water containing sewage. They are simple plants which contain chlorophyll and are capable of photosynthesis, the production of oxygen and carbohydrates in the presence of light. At night, in the absence of light, they utilize large amounts of oxygen and deplete surface waters of this vital constituent.

The fungi are plants which are devoid of chlorophyll and therefore unable to synthesize carbohydrates. The fungi include single-celled yeasts and multicellular molds and mushrooms.

Bacteria are yet another type of microorganism. The bacteria are single-cell organisms. A few types carry on photosynthesis; most do not. Many bacterial types operate similarly to yeasts in fermenting sugar and starches to alcohols and simple organic acids. Some form slimes. Bacteria differ structurally from yeasts and other fungi. (For example, they are somewhat smaller and do not have a well-defined cell nucleus.) Bacterial cells range from about 0.5 micron to about 5 microns in size. (A micron is equal to one-millionth of a meter or 1/25,400 of an inch.) Yeasts start at about this range and go up to about 30 microns or more in length. Cholera, typhoid fever and paratyphoid fever are diseases caused by bacteria.

Viruses are some ten to one hundred times smaller than bacteria. Because they lack the machinery to function on their own, they can function and reproduce only inside a living cell. Viruses are responsible for diseases such as polio and viral hepatitis, as well as the common cold.

Protozoa are very simple animal organisms. They range in size from tens up to thousands of times larger than bacteria. The protozoa include organisms which are responsible for amebic dysentery and malaria. The former can be transmitted through feces. Because most protozoa require oxygen, their disappearance from sewage can be used as an indicator of insufficient oxygenation.

Metazoa are multi-cellular animals (including man). One particular type of small metazoan, the rotifer, is abundantly present in well-aerated sewage and feeds on sewage and the smaller microorganisms. Snail fever, one of the most widespread water-borne diseases in the world, is caused by a metazoan flatworm.

Since sewage contains fungi, metazoa, protozoa, bacteria, and viruses, it can be a source of disease caused by these organisms unless it is adequately treated before being discharged to surface or ground waters.\*

\* For a discussion of waterborne diseases and rural water problems in general, see Water and Wastewater Problems in Rural America, Commission on Rural Water, Washington, D.C., 1973.

4

**Coliforms and Contamination** Microbiological contamination of water and aquatic animals is often inferred on the basic of a coliform count. Because of the virtually universal presence of the coliform *Escherichia coli* (*E. coli*) in the mammalian intestinal tract and because of the ease with which *E. coli* can be identified and counted in a water sample, the quantitative presence of this organism has come to be used as an index of contamination of water with human wastes. (Most strains of *E. coli*, by the way, are not generally harmful to humans in small numbers.)

The coliform test is not infallible, however. The methods normally used for identifying *E. coli* show positive results for other related bacteria which fall into the coliform group. One member of the coliform group, *Aerobacter aerogenes*, is normally found on plants and in the soil, yet reacts identically to *E. coli* in the simple tests. Further, there are many types of bacteria and microorganisms in addition to the coliforms in the intestinal tract. A positive coliform test can result from the presence of the soil bacterium *A. aerogenes* and the absence of fecal contamination, and a negative coliform test result doesn't rule out the presence of other harmful organisms, especially the more hardy viruses.

An interesting feature of bacteria and other microorganisms is that they are hardy. They exist in nature at remarkable extremes of temperature, pressure, humidity, and salinity. Treatments less thorough than complete sterilization under precisely controlled laboratory-type conditions won't kill all of them. Chlorination as it is practiced in treatment plants, for example, will not kill all bacteria, nor will it deactivate all viruses. The hardiest will remain.

Aerobic and Anaerobic Treatment in Individual Home Systems Sys

On a quantitative basis, water becomes saturated with oxygen at dissolved oxygen (DO) values of 9.02 mg/l at 20°C (68°F). If sewage has a BOD of several hundred, then each liter of sewage will require several hundred milligrams of oxygen for stabilization, some twenty to thirty times more than is dissolved in the water. If more oxygen is not supplied by natural absorption or mechanical mixing, the initial supply will be used up rather quickly, and the mixture will "go septic." Flowing waters have advantages for assimilat-

ing sewage effluents because of dilution and aeration opportunities. Stationary waters, such as lagoons, must depend on oxygen absorption at the air-water interface, and, depending on temperature conditions, lower layers are often anaerobic while the upper layers are aerobic.

#### On-Site Treatment Septic Tanks

On-site treatment of domestic sewage can be accomplished by decomposition and seepage into the soil (a privy) or by incineration, but most permanent installations utilize liquid medium techniques. The most familiar option is the septic tank, which by its very name implies anaerobic conditions (sepsis refers to bacterial action in the absence of air). Actually, there are two components of a septic tank system: the septic tank itself, which removes the settleable solid matter, and the subsoil disposal system (trench bed, leach field), which receives the effluent from the septic tank. Both components of the system provide sewage treatment, and, typically, more treatment is provided in the disposal system than in the septic tank. Septic tanks and cesspools depend on seepage of the liquid portion of sewage into soils where the sewage can be treated aerobically by soil microorganisms. Their oxygen is supplied by diffusion through the soil.

### Aerobic Tanks

Aerobic tanks can achieve an effluent of lower BOD than septic tanks, typically in the 20 to 100 mg/l range, but certainly not fully stabilized. Further treatment can be achieved either with subsurface discharge in soils or, where permitted by code, by surface discharge to land or bodies of water after suitable disinfection with chlorine or by other approved methods.

While there may be considerable difference in "strengths," sewage effluents from septic tanks, aerobic tanks, and cesspools all require some additional amount of stabilization before they can be regarded as fully treated and safe for other uses, including drinking. Furthermore, a residual sludge builds up in all of the processes, and the sludge must be removed from the system periodically. Disposal of sludge, especially septic sludge, often poses difficult environmental problems.

#### Factors to Consider in Selecting an On-Site Treatment System

If the soil is capable of absorbing and treating effluent, and if there is sufficient space for soil absorption systems on the lot (original plus room for an alternate in the event of failure), then a septic tank should be chosen because it is cheaper than an aerobic tank (several hundred vs. over a thousand dollars). In addition, septic tanks have no moving parts which require servicing or electric power, both of which add to operating costs. Aerobic tanks require regular servicing of the air compressor and are subject to breaking down in the absence of maintenance. Because properly functioning aerobic tanks can produce an effluent which may be less demanding of the soil than septic tank effluent, many states and localities permit smaller soil absorption systems for aerobic tanks than for septic tanks. A reduction in soil absorption area could represent a savings of several hundred dollars, reducing somewhat the spread between initial costs of septic and aerobic tanks. More importantly—especially for areas with marginal soils' capability for receiving effluent—aerobic-tank effluent, adequately disinfected by a method harmless to soil bacteria (ozonation, ultraviolet irradiation, or pasteurization, for example), reduces the threat to public health that the effluent could pose if the soil system were to fail. These relative advantages would be negated, of course, if the aerobic tanks and disinfection units were not properly maintained. Regular servicing and maintenance is a necessity.

# **Treatment Processes** Lagoons

# in Small Community Treatment Systems

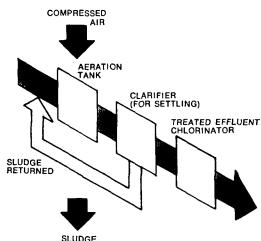
One of the more prevalent methods for treating wastewater in small communities uses a lagoon or stabilization pond. If a shallow pond of effluent is kept well mixed and aerated, aerobic processes can prevail. Algae can participate in the biochemical breakdown of sewage in lagoons because of the exposure to sunlight. When mixing is poor and the lagoon is run anaerobically, the dead and decaying algae help to deplete the dissolved oxygen, and the result can be a foul-smelling open septic tank. In a facultative pond, the upper layers of water (the water can separate into thermal layers if there is little physical mixing) operate aerobically, while the lower layers are anaerobic. Mechanical aerators can be floated atop the pond to keep the entire pond aerobic.

## Imhoff Tanks

An Imhoff tank is the community analogue of a septic tank. It is a two-story device, the upper level of which is a conical hopper which receives incoming raw sewage. The solids settle to the bottom of the cone and pass through an opening to the lower chamber where they undergo further decomposition. Gas from the decomposing sewage is drawn off from the lower chamber and may be used as a fuel for drying sludge.

#### **Activated Sludge Processes**

In the conventional activated sludge process, gelatinous masses (flocs), which are communities of many types of microorganisms, are kept in suspension in an aeration tank where air is bubbled through the mixture to provide the oxygen required by the microorganisms to consume the sewage. Because the flocs are heavier than water, they sink as sludge if not kept in suspension. From the aeration tank, partially treated sewage (called mixed liquor) flows into the clarifier, where clear water flows out the top and solids (aerobic colonies) sink to the bottom as activated sludge. Part of the activated sludge is then returned to the aeration chamber where it is re-aerated and kept in suspension to help provide treatment for the incoming raw sewage and the treatment cycle continues.



WASTED

ACTIVATED SLUDGE PROCESS

7

There are several modifications of the activated sludge process. Two are the *extended* aeration modification and the contact stabilization modification. In the extended aeration modification, the sewage is detained in the aeration chamber for a long time (as much as twenty-four hours) to obtain the desired degree of treatment. In the contact stabilization modification, the activated sludge is conditioned for several hours in a re-aeration (or stabilization) zone before being returned to the mixed liquor for contact with raw sewage. The extra aeration of the concentrated sludge enables it to digest the sewage more quickly, permitting higher throughput in a contact stabilization plant than in a conventional activated sludge plant. Contact stabilization requires close supervision by skilled operators, else the process can go awry.

The conventional activated sludge process is sensitive to highly uneven (shock) loads of sewage. For this reason, small scale activated sludge plants are normally designed to operate in the extended aeration mode, which is somewhat less sensitive to shock loading. Small plants for subdivisions (package plants) are normally scaled-down versions of the big municipal plants. Many of the individual home aerobic plants are designed as further scaled-down versions of larger activated sludge plants, or designers at least attempt to retain as many of the principles of the activated sludge process as they can.

#### **Trickling Filters**

If the gelatinous colonies of aerobic and facultative organisms are allowed to form on a medium having a large surface area, such as a bed of rocks, shredded tree-bark, or corrugated plastic materials, wastewater can be stabilized as it slowly passes over the slimy surface. After large solids are either removed from sewage or ground up, the wastewater can be trickled through an extended filter consisting of the slime-coated materials. This is the principle of the trickling filter plant. At least one manufacturer has taken advantage of the mechanical simplicity of the trickling filter and has designed a plant of subdivision proportions.

Physical-Chemical Sewage Treatment The processes described so far (except incineration) make use of natural biological processes for stabilizing sewage. Several manufacturers have developed plants which use combinations of physical processes, such as radiation, grinding, and heat, and chemical processes, such as ozone and other oxidizers and coagulants, for solids removal, stabilization, and disinfection, as well as removal of other constituents. Physicalchemical plants are especially adaptable for use aboard ship where it might be difficult to maintain a mixed liquor. They are also suited to land areas where severe climate might limit the usefulness of biological processes. One very promising physical-chemical technique, reverse osmosis, uses mechanical pressure and membranes with exceedingly small passages to strain impurities from the wastewater. It is likely that such advanced techniques will be adapted for use in rural areas. To the extent that they are independent of biological processes and at the same time based on rugged physical and chemical processes, these techniques may someday be preferred to present methods.

# The Role of Soils in Wastewater Disposal

# Soil Characteristics Relevant to the Application of Wastewater

The term soil in a generic sense means the surface layer of the earth's crust. It is formed by the interaction of weather, plants, and animals on rock and other materials coating the earth's surface and may range in thickness from a few inches to five or ten feet. It is the link between the rock core of the earth and life on its surface.

Soil serves as the medium which absorbs and filters effluent from domestic treatment units. How well the system works depends on the rate at which the effluent moves into and through the soil. Some soils absorb effluent rapidly, others slowly. If the sewage is not absorbed readily, unfiltered sewage may reach the ground surface or may pass rapidly through the soil and contaminate ground water.

Man has attempted to apply many classification systems for soils based on various criteria for specific purposes. The most useful systems for understanding the role of soils as treatment media for wastewater involve descriptions of the particles making up the mineral fraction of the soil and the arrangement of these particles to each other, both in the horizontal and vertical directions.

A soil is an assemblage of mineral particles interspersed with voids. These voids, which may or may not be directly interconnected, are called pores and can be occupied by gases, liquids, and living organisms. The total amount of voids per unit volume is referred to as *pore space*. The solid portion of the soil mass, the mineral particles, is often referred to as the *skeletal portion* of the soil, and the pattern of arrangement of the individual particles or aggregates formed from them, the *soil structure*.

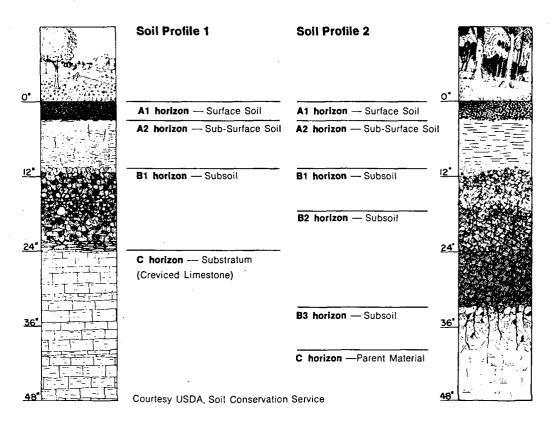
The average soil has about 50 per cent pore space. This 50-50 division is based on an average oven-dry bulk density of 1.3 g/cm<sup>3</sup> bulk soil (solids and void space) and a particle density of 2.6 g/cm<sup>3</sup>. Under normal conditions, after gravitational water has been drained from the soil following a rainfall, the water held in the soil will vary from about 30 per cent of the bulk volume to 15 per cent. The air space will vary accordingly from 20 to 35 per cent.

The solid part of soil is composed of minerals and small amounts of organic matter. The minerals are in the form of gravel, sand, clay and silt. A few soils are entirely organic in nature. These are formed in peat and muck of different thicknesses ranging from a few inches to over fifty feet.

#### The Soil Profile

The process of soil formation is a dynamically evolving system wherein the rock of the earth is continuously converted by disintegration, decomposition, eluviation, deposition, compaction and alteration. Soil evolution continues through active processes such as weathering and produces a series of horizontal layers in the soil. The resulting horizontal layering is known as the *soil profile*. The nature of the soil profile, and thus, the nature of the soil, determines its capacity to recycle wastewater.

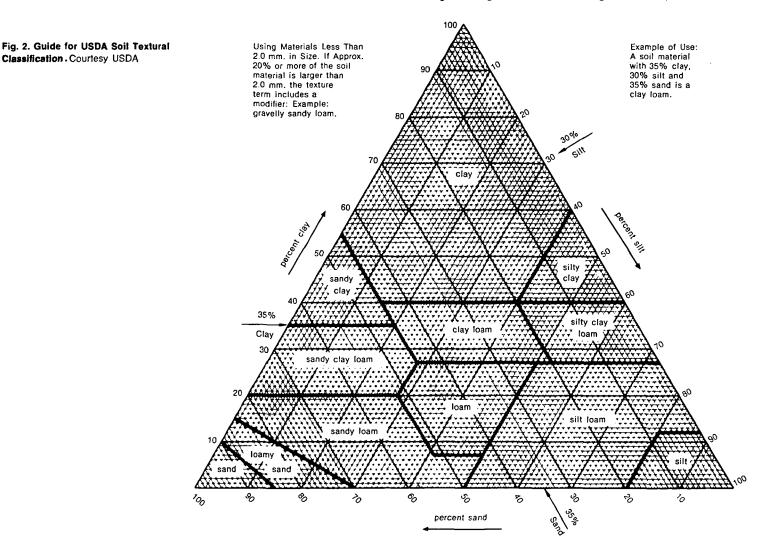
Most soils are weathered or developed to depths of two to five or six feet. Soil horizons (layers) develop parallel to the earth's surface. Usually there are two or more. The major horizons are commonly referred to as surface soil, subsoil, and substratum or parent material, or by the letters A, B, and C. There can be several identifiable subhorizons within each major horizon. All of these horizons develop as a result of physical, chemical and biological processes working together, each playing its part in soil formation. Each horizon differs from the others in one or more of the major properties of texture, structure, porosity, and color. The ability of the soil to absorb and renovate wastewater



depends most upon the soil properties of texture, structure, internal drainage, depth and slope.

**Soil Texture.** Texture refers to the per cent of sand, silt and clay in a soil. The texture is specified individually for each soil horizon because it is seldom the same throughout an entire soil profile.

The most convenient system of soil classification for use in wastewater considerations is the U.S. Department of Agriculture (USDA) Textural Classification. [3] Texture is determined by the relative proportions of sand, silt and clay in a soil. Sand, silt and clay differ from each other in their particle sizes. For this reason, texture is sometimes called "particle size" or "soil separates." The USDA textural classification of a soil is determined from the texture triangle in Figure 2. A soil having about 20 per cent sand,



#### The Role of Soils in Wastewater Disposal

70 per cent silt, and 10 per cent clay, for example, falls right in the center of the zone of silt loams. Conversely, the average silt loam has the sand-silt-clay makeup just cited. Of the three particle sizes, sand is the largest, silt particles are next in size, and clay particles are the smallest. The sizes according to the USDA system are:

| Texture Name     | Diameter (Millimeters) |  |  |  |
|------------------|------------------------|--|--|--|
| Very coarse sand | 2.00-1.00              |  |  |  |
| Coarse sand      | 1.00-0.50              |  |  |  |
| Medium sand      | 0.50-0.25              |  |  |  |
| Fine sand        | 0.25-0.10              |  |  |  |
| Very fine sand   | 0.10-0.05              |  |  |  |
| Silt             | 0.05-0.002             |  |  |  |
| Clay             | Under 0.002            |  |  |  |

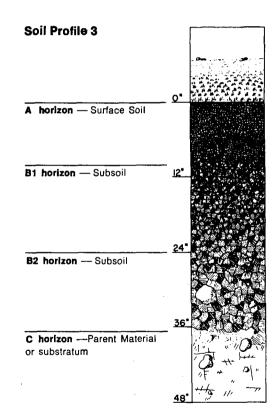
Texture is determined in the laboratory by mechanical analysis. Particles larger than 2.0 mm are classed as gravel and are screened out before doing the particle size analysis. The different-sized sands are screened by means of sieves; and the remainder of the sample, silt and clay separates, are calculated from their settling speeds in water. Silt settles out in about thirty-three minutes and clay in about twenty-two hours.

Texture is determined in the field by rubbing the soil between the fingers. Proficiency is gained only through experience and practice with samples of known texture.

There is a great difference in the physical and chemical activity of the different-sized soil particles. The greatest amount of activity takes place on the surface of clay particles. The surface area of a pound of clay particles, for example, may be as high as twenty-five acres, whereas the surface area of a pound of sand particles will be only three to five acres. The surface area of the clay particles thus imparts the chemical and physical behavior characteristics of clay to those soils which contain a higher percentage of clay than of sand and silt. Silt supplies some activity but not as much as clay. The gravel and sand fractions are inactive chemically, but perform important functions by making soils crumbly (friable) and by providing larger pore space for internal drainage and percolation.

Clay provides soil with plasticity, shrink-swell potential, water and air retention, and cohesion. It also enables soil to react chemically, to hold wastewater and its nutrients, and to recycle the nutrients into plants before they can leach into ground water. Sands, on the other hand, permit nutrients and water to move through the soil more rapidly and thus impose a greater hazard for the contamination of ground water than do soils with appreciable amounts of clay and silt.

**Soil Structure.** Soil structure is the natural grouping of soil particles, called aggregation. A synthetic aggregate can be made by mixing glue with a teaspoonful of sand, silt, and clay. The cementing agents in the soil that promote aggregation and hold the particles together are organic colloids, silica and sesquioxides. As aggregates begin to form in



## The Role of Soils in Wastewater Disposal

the soil, they develop a definite arrangement by horizons. Soil structure, or aggregation, modifies the effects of texture upon air and water movement and ease of plant root penetration.

The common kinds of structure are:

13

Granular---Rounded aggregates; common to but not restricted to the surface horizon.

Platy—Flat plates; common to but not restricted to the subsurface.

Blocky—Cube-like aggregates typical of most subsoils.

Other kinds of structure include prismatic, columnar and several variations of blocky, but the above three kinds best demonstrate the principles of soil water movement as modified by structure.

There are two kinds of non-aggregated arrangement of soil particles, or structureless soils:

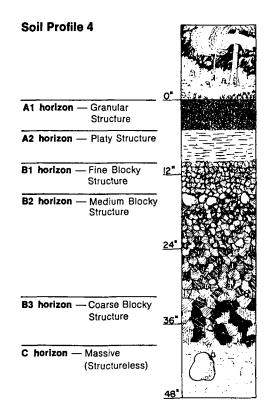
Single grain arrangement in sandy soils where each soil particle is a separate entity. Thus there are no aggregates and no modification in water movement by soil structure. Dune sand is an example.

Massive arrangement of soil particles, in which the soil texture arrangement is in the form of a solid mass except for random cracks that develop as a result of soil wetting, drying, freezing and thawing.

The size, shape and arrangement of aggregates and the extent to which the plates or blocks overlap each other has an influence on water movement within and between the different horizons. Thus, structure determines to a great extent the amount of water entering the soil (infiltration) and the amount moving through the soil (percolation and permeability). Granular and blocky structure (without overlap) allow water to move freely in a more or less direct or straight line path. Platy and blocky structures with overlapping of the blocks and plates impede water movement because of the circuitous path that water must follow around the ends of the overlapping plates and the overlapping blocks. Only small amounts of water move through the aggregates and then very slowly. Water movement is rapid through single grain structureless soils and slow through massive structureless soils.

Internal Soil Drainage (Wetness). Soil drainage is important to wastewater application because a poorly drained soil cannot supply the oxygen required by soil microbes for stabilizing sewage and because the liquid has no place to go if the soil won't drain.

The movement of soil water, especially excess water that moves downward as a result of gravity or of draining out, is called internal soil drainage or natural drainage. It is



controlled by texture, structure, pans (impenetrable layers), height of the seasonal water table, and underlying layers.

A clue to a soil's natural drainage or wetness is the color or variation in color of the soil profile. One of the main coloring substances—other than organic matter which is gray-black—is iron. When air is replaced by water in the soil pores over long periods of time, iron exists in the reduced (ferrous) state and is gray in color. When the air supply is high in proportion to water in the pores, the iron is in the exidized (ferric) state (hematite) and is a red-brown or bright color compared to gray. Soils with bright colors are called *well drained*, and soils with the predominantly dull gray colors are called *poorly drained*. If, over a long period of time a soil has been alternately wet and dry, a combination of the two forms of iron develops and a third, called limonite, which is yellow also develops. This produces a mottled color—a mixture or variegation of colors. Soils with only fair drainage may have an intermingling of colors such as gray, yellow, red, and brown. Examples of the chemical reactions that occur in soil are shown in the box below.

| 4 FeO<br>Ferrous oxide<br>gray                   | + | O₂<br>oxygen | oxidation                | 2 Fe₂O₃<br>Ferric oxide<br>Red-Brown<br>(Hematite)                                                 |
|--------------------------------------------------|---|--------------|--------------------------|----------------------------------------------------------------------------------------------------|
| Fe₃O₃<br>Ferric Oxide<br>Red-Brown<br>(Hematite) | + | H₂O<br>Water | hydration<br>dehydration | Fe <sub>2</sub> O <sub>2</sub> + H <sub>2</sub> O<br>Hydrated Ferric Oxide<br>Yellow<br>(Limonite) |

A soil with poor internal drainage is characterized by predominantly gray surface and subsurface horizons. The color results from reduced iron and indicates prolonged wetness. (However, one must not confuse a well-drained soil which may be colored dark grayish-black by a high content of organic matter with a poorly-drained soil.) A well-drained soil has a dark gray-brown surface colored by organic matter and a subsoil of bright reddish-brown coloring. The parent material or substratum may contain gray or mottled colors. A soil with intermediate natural internal drainage has a surface horizon colored by organic matter and mottling or a mixture of red, brown and gray colors in the subsoil.

#### **Movement of Wastewater in Soils**

Water retention within the soil and water movement through the soil are the two properties of special interest in considering soil as a disposal medium. Water retention is governed largely by surface-tension forces, while water movement is governed by other forces, mainly gravitational and capillary, and is opposed by the surface-tension forces. A variety of factors affect the pattern of soil water movement: namely, absorption capacity, infiltration, percolation-permeability, depth to and nature of underlying parent material, depth to water table, amount of water present in the soil, and mineralogy. [3, 4, 5]

**Absorption Capacity.** The absorption capacity of the soil, or the amount of liquid it can hold, is to a large extent a function of the soil structure. The smaller the size of the interconnections between pores, the greater the water-retaining capacity because of surface tension forces. Since pore size is in part a function of particle size, the finer the particle size, the smaller the pores, and the larger the particles, the larger the pores between the particles. With larger particles surface tension is lower and water moves through it more easily. In general, within any given climatic regime, the capacity of the soil to hold wastewater is greatest in clays and least in sands. Aggregation of silts and clays into soil structural units, creating larger apparent particle sizes, usually increases water movement rates. The properties of soil which affect its liquid-holding capacity also affect the ease with which the liquid can move in the soil, or permeability.

**Infiltration.** Infiltration is the entry of water into the soil. The infiltration rates of soils differ greatly with particle size distribution, the structure of the soil, vegetative cover, clay mineral type, and moisture content. An unvegetated clay soil, for example, tends to develop a crusty layer following rainfall due to destruction of the soil structural units. Such a crust impedes infiltration and enhances runoff. On the other hand, in sands the infiltration rate is usually high, even after compaction by rainfall impact. Few generalizations concerning infiltration rates are valid over the great number of climatic and physiographic zones of the United States, although soils with considerable organic matter in the topsoil tend to have higher infiltration rates than soils with lower organic rates than soils with poor structure.

**Permeability.** Permeability is the ability of the bulk soil to transmit water and is commonly measured as the rate of water movement through the soil. It is usually determined as a constant rate when the soil is saturated, and it is commonly expressed in units of inches per hour.

The open spaces, voids, or interstices in the soil are receptacles which store and transmit water. The size, type, shape and arrangement of the voids are the chief contributing factors to water movement and storage and are determining factors in the permeability. Water movement (percolation) occurs chiefly through the larger macropore spaces and is a function of the number of these spaces and their continuity. Water movement through pores is greatly impeded if they contain entrapped air. Studies have shown that in sterile soils permeability gradually increases with water flow because of the removal of entrapped air from the soil pores. The flow of water has also been found to be greatly impeded in long submerged soils by the production of gums in soil pores by microorganisms. Another factor affecting soil permeability is the tendency for soil minerals and organic matter to hydrate in water. This process decreases the size of soil pores and limits the freedom of flow.

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Permeability may be generally evaluated by observing the soil profile and by estimation of such physical properties as texture, structure, and color. Soil-survey procedures are usually supplemented by field and laboratory tests on the soils at representative sites. Field observations are made through soil-survey procedures with careful attention to soil structure and overlap and to soil horizons that are high in clay, cemented, or otherwise dense in appearance. Such observations usually indicate whether soils are readily permeable or relatively impermeable. Soils of apparently low permeability need close study.

**Percolation.** Percolation is an overall or gross measure of the movement of water in the soil after the water has infiltrated through the very top soil layer. Knowledge of the rate of the movement of water into and through the soil, the *percolation rate*, is prerequisite to any wastewater treatment involving the soil. The common unit of measurement is minutes per inch, the inverse of permeability units. Percolation rates usually vary from soil horizon to soil horizon, with the limiting rate for any soil profile being the lowest rate in any one horizon.

At present, there are different methods of characterizing the varying percolation properties of the soil (both saturated and unsaturated). Many states have established regu-

#### How to Make a Percolation Test. [4,5]

1. Dig six or more test holes four to twelve inches in diameter and about as deep as you plan to make the trenches or seepage bed. Space the holes uniformly over the proposed absorption field. (See Figure 3 for a diagram of a test hole and test hole distribution. Roughen the sides of each hole to remove any smeared or slickened surface that could interfere with water entering the soil. Remove loose dirt from the bottom of the holes and add two inches of sand or fine gravel to prevent sealing.

2. Pour at least twelve inches of water in each hole. Add water as needed to keep the water level twelve inches above the gravel for at least four hours — preferably overnight during dry periods. (If percolation tests are made during a dry season, the soil must be thoroughly wetted to simulate its condition during the wettest season of the year. The results should then be the same regardless of the season.)

3. If water is to remain in the test holes overnight, adjust the water level to about six inches above the gravel. Measure the drop in water level over a thirty-minute period. Multiply that by two to get inches per hour. This is the percolation rate. After getting the percolation rate for all the test holes, figure the average and use that as the percolation rate.

4. If no water remains in the test holes overnight, add water to bring the depth to six inches. Measure the drop in water level every thirty minutes to four hours. Add water as often as needed to keep it at the six-inch level. Use the drop in water level that occurs during the final thirty minutes to calculate the percolation rate.

5. In sandy soils, where water seeps rapidly, reduce the time interval between measurements to ten minutes, and run the test for only one hour. Use the drop that occurs during during the final thirty minutes to calculate the percolation rate.

6. Percolation tests for seepage pits are made in the same way except that each contrasting layer of soil needs to be tested. Use a weighted average of the results in figuring the size pit you need.

lations governing the permissible ranges for percolation rates according to the types of effluent—whether from septic tank installations or aerobic system effluents, for example.

In wastewater investigations the rate of movement of water in the soil is normally inferred from a percolation test, which is a measure of both infiltration and permeability. (Recent studies by soil scientists and sanitary engineers suggest that estimates of percolation can also be obtained from the study of soil morphology and soil profile characteristics. [6] This method will be described shortly in the section on the use of soil surveys.)

Percolation tests help determine the absorption capacity of the soil and the size of the absorption field. Most local regulations require that trained personnel, generally from local health departments, do the testing.

Inaccuracies in percolation tests have been documented, and are usually related to how tests are done and the time of year tests are conducted, that is, whether the soil is wet or dry. Results are reliable only if the soil moisture is at or near field capacity when the test is made. Excessive percolation rates are obtained when there are small cracks or crevices in the soil because of insufficient moisture. False rates are also obtained when percolation tests are made in naturally wet soils which are dry during periods of low rainfall and are not thoroughly moistened before testing. A generally accepted percolation test procedure is given in the box on page 16.

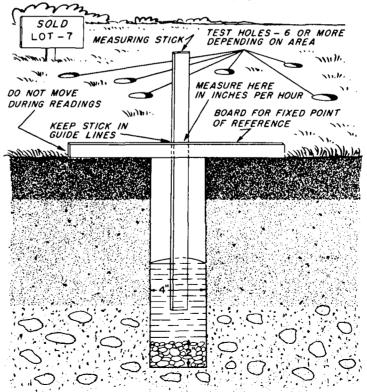


Fig. 3. Percolation test hole with other test holes properly distributed over the field in the background. A measuring stick is shown in the test hole in the foreground. Courtesy USDA, Soil Conservation Service.

#### The Role of Soils in Wastewater Disposal

Percolation data do not represent just the vertical movement of water through soils, but are complicated by lateral transmissions. The relationship between permeability and percolation, as well as the general classes into which they fall, was illustrated by Foth and Turk: [7]

|    |                      | Permeability                                                                                                                    | Percolation                                                                                                                                               |
|----|----------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Classes              | (inches per hour)                                                                                                               | (minutes per inch)                                                                                                                                        |
| 1. | Very Slow            | less than 0.05                                                                                                                  | greater than 1200                                                                                                                                         |
| 2. | Slow                 | 0.05-0.20                                                                                                                       | 300-1200                                                                                                                                                  |
| 3. | Moderately Slow      | 0.20-0.80                                                                                                                       | 75-300                                                                                                                                                    |
| 4. | Moderate             | 0.80-2.50                                                                                                                       | 24-75                                                                                                                                                     |
| 5. | Moderately Rapid     | 2.50-5.00                                                                                                                       | 12-24                                                                                                                                                     |
| 6. | Rapid                | 5.00-10.00                                                                                                                      | . 6-12                                                                                                                                                    |
| 7. | Very Rapid           | more than 10.00                                                                                                                 | less than 6                                                                                                                                               |
|    | 3.<br>4.<br>5.<br>6. | <ol> <li>Very Slow</li> <li>Slow</li> <li>Moderately Slow</li> <li>Moderate</li> <li>Moderately Rapid</li> <li>Rapid</li> </ol> | Classes(inches per hour)1.Very Slowless than 0.052.Slow0.05-0.203.Moderately Slow0.20-0.804.Moderate0.80-2.505.Moderately Rapid2.50-5.006.Rapid5.00-10.00 |

**Depth and Nature of the Underlying Parent Material.** The nature of the substratum immediately under the soil profile may exert stresses on the capability of the soil to adequately serve as a treatment medium for the conversion of wastewaters to clean water. Dense substrata, either of clay materials or of such rock types as shale, argillite, or cemented sandstones, prevent or limit vertical movements of fluids. Highly fractured substrata underlying shallow soil profiles may promote such rapid water movements as to foster contamination of ground water.

The influences of the substrata on water movements within the soil profile are functions of the thickness of the profile, as well as the nature of the substrata. The thicker the soil mantle, the less the influence of the substrata on the capability of the soil to process wastewater. This relationship has resulted in many states creating suitability classifications based on the depth to and nature of the substratum.

# The Use of Soils in Wastewater Systems

#### General Principles for Applying Wastewater to Soil Absorption Systems

The following principles apply to both surface (spray irrigation, for example) and subsurface absorption systems:

(1) Wastewater should not be applied in amounts which exceed the water-holding capacity of the soil. This will keep the soil pores from filling with water to the exclusion of air, and it will permit the biological and chemical renovating processes including aeration, filtration and stabilization, to proceed normally. It will mean that plants can grow well and take up contaminating elements such as nitrogen and phosphorus. (Phosphates applied in excess of plant needs will have a better chance of being held on the surfaces of clay particles.) It will also prevent the leaching to ground water of nitrates not used up during the growing season. In addition, this precaution will minimize runoff or overland flow that might reach wells, streams or other bodies of open water.

#### The Role of Soils in Wastewater Disposal

(2) The rate of application of nutrients contained in wastewaters should not exceed plant growth requirements. This will help to prevent the contamination of ground water. The plants (which contain the converted nutrients) should then be removed by cropping, and the residues (e.g., corn stalks) should also be removed rather than plowed back or in any way recycled to the soil. Otherwise plant material will accumulate to dangerous levels in soils, and the nutrients can be leached by rains and carried to ground water.

#### The Use of Soil Surveys in Planning Systems

The soil survey of a county or other area includes descriptions of soils, interpretations for soil use, and maps showing the location and extent of each kind of soil.

They are made by the Soil Conservation Service in cooperation with state agricultural experiment stations and other federal and state agencies. Local or county offices of the Extension Service or of the Soil Conservation Service, the soil conservation district, or the state agricultural experiment station can furnish information about the availability of soil survey materials.

The survey points out the limitations of various soils and the hazards in using them for different purposes. Soil surveys published in recent years give interpretations and other information useful in planning nonfarm soil uses, including septic tank sewage and lagoon disposal systems. Older surveys give interpretations only for farm uses, but the soil descriptions contain basic information from which interpretations for nonfarm uses can be made. Anyone needing such interpretations usually can get help from the local conservation district or the extension service.

**The Use of Soil Maps.** Soil maps can substitute for percolation tests, according to Morris, Newbury and Bartelli. [6] They have offered several advantages of using soil maps in determining the suitability of building sites for soil absorption sewage disposal systems:

—Interpretations of the soil mapping unit will indicate whether or not the soil at a particular site is subject to an intermittent high water table. This will avoid the criticism of variability of the percolation test rates, resulting from the tests being conducted during different seasons of the year.

-The suitability of a site can be based on the performance of the soil at five (or probably more) other site locations instead of merely the six test holes on one site. By this method, the confidence limits would be greatly improved, from 30 to 95 per cent.

-The use of soil maps will permit the determination of site suitability for the correlated soil types regardless of the time of the year at which the request for determination is made.

A typical soil map is shown in Figure 4.

The soil map is reliable for predicting general soil capabilities for an area of several acres. However, it may not contain enough detail to predict the limitations for a specific disposal site, because different kinds of soil can occur within short distances. The maps are likely to be least reliable in the vicinity of a soil boundary (see Figure 5). On-site evaluation by a soil scientist is usually necessary. In most cases he will use the percolation test.

#### Soil Factors that Affect Subsurface Absorption Fields

The Rating of Soils for Subsurface Absorption. As previously described, the Soil Conservation Service rates soils in terms of their limitations for various uses, including



Fig. 4. Soil Map, Montgomery County, Md. Courtesy USDA, Soil Conservation Service.

The symbols indicate the different soils and the solid lines show the extent of each. WhA is a flood-plain soil. WoA, a wet soil in upland drainage-ways. Water from higher surrounding areas runs off and concentrates in the natural drainage courses, resulting in frequent flooding. IdB2 has a dense layer of clay that is very slowly permeable to water and a high shrinkswell potential. LeB2, LeB3, LeC2, and LeC3 are shallow to rock and some have lost all original surface soil. Soil and water conservation practices to control erosion and reduce runoff are needed on all the steeper slopes, shown by C and D in the map symbol. They also require more excavation for construction and great care in installing filter fields for the effluent from septic tanks. The severely eroded areas, shown by a 3 in the map symbol, may need top-soil for good lawns and gardens.

# The Role of Soils in Wastewater Disposal

21

wastewater disposal. The classifications used in rating soil limitations are defined as follows: [3]

Slight means that the soil properties are generally favorable and that the limitations are minor and easily overcome.

*Moderate* means that the soil properties are unfavorable but can be overcome or modified by special planning and design.

Severe means the soil properties are so unfavorable and so difficult to correct that they would require major soil reclamation and special designs. This may be costly and make it impractical to install the system.



Fig. 5. Soil map of an area in the Piedmont region. A hypothetical building lot is outlined in the upper part of the map and enlarged below. Note from detail of insert that soil boundaries shown on map may be imprecise. Courtesy USDA, Soil Conservation Service.

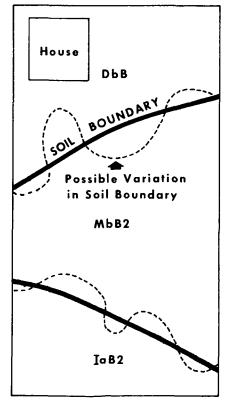


Table 1 is a guide for rating soils for septic tank absorption fields.

The soil limitation ratings are not quantitative-they are indications of the kind of problem and the magnitude of difficulty that may be encountered in the design of an effective wastewater treatment and disposal system. As soil mapping units are not always homogeneous, the limitation classification is a good guide to areas in which more detailed investigations may be needed.

While nearly all limitations can be overcome with sufficient investment, some limitations should be considered as detriments of such magnitude as to constitute areas in which subsurface disposal should not be attempted. The limitations of flood plain location and depressional topography are two examples. The limitations of high water table or steepness of slope are severe limitations, but may be overcome by implementation of soil engineering.

Selecting a Site for a Septic Tank Absorption Field. [3, 4] Soils vary so much from place to place that it is not possible to give specific guidelines on the use of soils as absorption fields that will fit all localities. In general, how well a septic tank sewage disposal system works depends on the rate at which effluent moves into the soil (infiltration) and through the soil (percolation). Several other soil characteristics may

| Table 1.         Soil Limitation Ratings for Septic Tank Absorption Fields. |  |
|-----------------------------------------------------------------------------|--|
|-----------------------------------------------------------------------------|--|

|                                                             | Degree of soil limitation                                      |                       |                                 |  |  |
|-------------------------------------------------------------|----------------------------------------------------------------|-----------------------|---------------------------------|--|--|
| Item affecting use                                          | Slight                                                         | Moderate              | Severe                          |  |  |
| Permeability class*                                         | Rapid,† moder-<br>ately rapid,<br>and upper end<br>of moderate | Lower end of moderate | Moderately<br>slow‡ and<br>slow |  |  |
| Hydraulic conductivity rate (Uhland core method)            | More than 1<br>in./hr. <del>†</del>                            | 1-0.6 in./hr.         | Less than 0.6<br>in./hr.        |  |  |
| Percolation rate (Auger hole method)                        | Faster than 45<br>min./in.†                                    | 45-60 min./in.        | Slower than 60 min./in.         |  |  |
| Depth to water table                                        | More than 72 in.                                               | 48-72 in.             | Less than 48 in.                |  |  |
| Flooding                                                    | None                                                           | Rare                  | Occasional<br>or frequent       |  |  |
| Slope                                                       | 0-8%                                                           | 8-15%                 | More than 15%                   |  |  |
| Depth to hard rock,§ bedrock, or other impervious materials | More than 72 in.                                               | 48-72 in.             | Less than 48 in.                |  |  |

\*Class limits are the same as those suggested by the Work-Planning Conference of the National Cooperative Soil Survey. The limitation ratings should be related to the permeability of soil layers at and below depth of the tile line.

findicate by footnote where pollution is a hazard to water supplies.

In arid or semiarid areas, soils with moderately slow permeability may have a limitation rating of moderate. \$Based on the assumption that tile is at a depth of 2 feet.

Source: Guide for Interpreting Engineering Uses of Soils, USDA, Soil Conservation Service, Nov. 1971, p. 23.

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# The Role of Soils in Wastewater Disposal

23

also affect performance: soil permeability, groundwater level, soil depth, underlying material, slope, and proximity to streams or lakes. [4, 5]

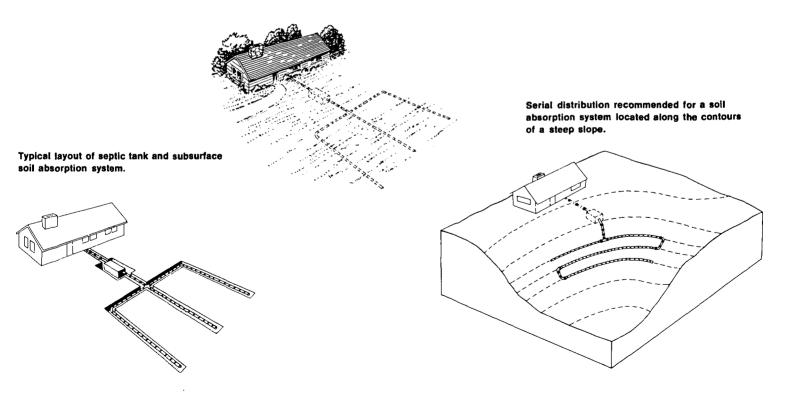
The following *guidelines* should be kept in mind both for the protection of individual and public health and for convenience in selecting the site for the wastewater absorption field:

-Soil permeability should be moderate to rapid, and the soil percolation rate should generally be sixty minutes per inch or less, unless special engineering precautions will be taken.

---The ground water level during the wettest season should be at least four feet below the bottom of the trenches in a subsurface tile absorption field and four feet below the pit floor in a field using seepage pits.

-Rock formations or other impervious layers should be more than four feet below the bottom of trenches, seepage bed floor, mounds or pit floor.

-Trenches and seepage beds are difficult to lay out and construct on slopes steeper than 15 per cent. If steep, shallow soils that are underlain by rock or other impervious material are used as absorption fields, the septic tank effluent is likely to seep to the surface.



-The site for an absorption field should not be within fifty feet of a stream or other water body.

-A sewage disposal system should never be installed in an area subject to flooding (flood plain).

-An area in which different kinds of soil are present within short distances may not be suitable for installation of a conventional absorption field if the soils differ greatly in their absorption capacity. In such an area, a detailed inspection should be made of the site.

In addition, the designer should conform to all local health regulations. Because they vary greatly, he should become familiar with permit and inspection requirements and the penalties that may be imposed for violations.

Advice and planning assistance may be obtained from the city or county planning commission, local health department, Soil Conservation Service, extension specialist, engineering or agricultural department of colleges and universities, and the state board of health or environmental health department.

**Why Subsurface Absorption Fields Fail.** Inspections by sanitary engineers have shown that sewage absorption fields often fail to work properly because: (1) soils are either poorly drained or are so compact that the absorption rate is very slow, or (2) sewage has clogged the pores and reduced the absorption capacity. [3, 5, 6]

Poorly drained soils are saturated with water during wet weather and contain no space for septic tank effluent. Absorption fields in such soils may function well in dry weather and fail to function in wet weather. If a soil has a very slow absorption rate, the effluent may rise to the surface in dry weather, and in wet weather the situation is even worse.

Absorption fields also fail if the land is too steep; if there is a seasonal high water table, a shallow layer of soil over bedrock, or a cemented layer of soil just below the trench bottom; or if the area is flooded periodically.

A septic tank system should function well for many years if it is properly installed and maintained and if the soil in the disposal area is satisfactory. If the soil is not satisfactory, the sewage disposal system will not work properly, regardless of how well it was constructed and installed.

# The Role of Evapotranspiration in Soil Absorption Systems

Evapotranspiration is a collective term for the processes by which water moves from the soil to the atmosphere. When conditions are favorable, part of the liquid applied to the soil may be dissipated by evapotranspiration, thus relieving the stress on the soil as the sole means of disposal. Evapotranspiration consists of evaporation, the loss of water vapor from land or water body surfaces to the air, and transpiration, the net movement

of soil water through plants to the air. Evapotranspiration is also known as transvap and consumptive use, as well as by its abbreviation, ET.

In order for water to be transpired, it must first enter a plant. Thus, soil moisture which is below the root zone is unavailable for transpiration. As water is evaporated from the land surface, more water moves upward through the soil and against gravity to take its place. The process is capillary action, akin to the working of a wick. The capillary movement depends on the texture and structure of the soil—narrow pores result in greater capillary forces, but the water cannot move easily (permeate) unless there is reasonable continuity between pores. Clays have small pores, but many clays are more impermeable than others because of their structure. Sands are usually highly permeable, but the large pores develop lower capillary forces, and the water may not be sucked upward as well as in tighter soils. A sandy loam or loam might be expected to have the optimum combination of pore size and structure to promote capillary movement.

#### Measurement and Estimates of Evapotranspiration

Evaporation is normally measured at meteorological stations with big cylinders about the size of a child's wading pool. These are called pans, and the standard pan in the U.S. is called a Class A pan. The upper limit of evapotranspiration, or potential evapotranspiration, is about 70 to 80 per cent of Class A pan evapotranspiration. Potential evapotranspiration may be attained during the growing season when the soil is wellmoistened (at field capacity).

Potential transpiration is also assumed by some authorities to be equal to lake evaporation which, as it happens, turns out to be between 70 and 80 per cent of Class A pan evaporation. Thus, no matter which data are used, the estimated values of potential evapotranspiration should work out to be fairly close to each other. Figure 6 shows contours of equal average annual lake evaporation for the forty-eight contiguous states.

Evaporation and evapotranspiration are greatest during the period May through October, which is also the growing season. In the northern forty-eight contiguous states around 80 per cent of evaporation occurs during May-October, while in the South about 60 to 70 per cent occurs during May-October. [8] Evapotranspiration can be counted on as more of a year-round process in the South than in the North.

#### Engineering Design with Evapotranspiration

In figuring how much of the liquid volume applied to the soil can be disposed by evapotranspiration, the amount of rainfall which enters the soil must be subtracted from potential evapotranspiration. Proper grading and drainways can minimize the amount of precipitation which is absorbed by maximizing runoff from the area of the soil absorption system, but conservative engineering practice assumes that evapotranspiration minus precipitation on a month-by-month basis is a reasonable estimate of the assist that evapotranspiration can provide. Table 2 shows how to estimate the assist that may be expected from evapotranspiration in Roanoke, Virginia, and in Albuquerque, New Mexico. These examples demonstrate that evapotranspiration can be expected to provide a reasonable assist in parts of the Southwest, but it should not be counted on too greatly in Appalachia.

Bernhart has been able to make considerable use of evapotranspiration. His studies in Ontario indicate that evapotranspiration can be helpful all year round with proper grading, vegetative cover, and the maintenance of aerobic conditions in the absorption bed. (See Appendix A.)

# **Soil Factors That Affect Sewage Lagoons**

A sewage lagoon (aerobic) is a shallow lake used to hold sewage for the time required for bacterial decomposition. Sewage lagoons require consideration of the soils for two

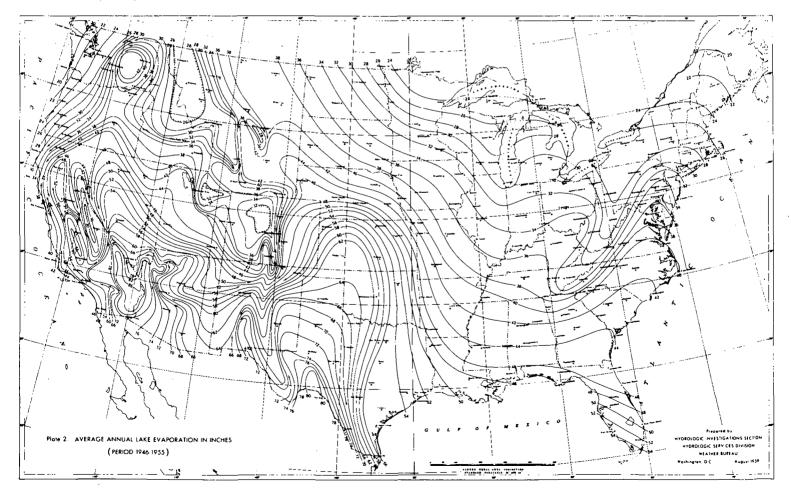


Fig. 6. Average annual lake evaporation for the forty-eight contiguous states. Courtesy National Weather Service, Wash., D.C.

### The Role of Soils in Wastewater Disposal

functions: as a vessel for the impounded area and as soil material for the enclosing embankment. Enough soil material suitable for the structure must be available, and when the lagoon is constructed, it must be capable of holding water with minimum seepage. The material should be free of coarse fragments (over ten inches in diameter) that interfere with compaction.

**Basin Floor.** Soil requirements for basin floors of lagoons are: (1) slow rate of seepage, (2) even surface of low gradient and low relief, and (3) little or no organic matter. Official specifications for lagoons state that the depth of liquid should be not less than two feet and generally not more than five feet, that the floor should be level or nearly so, and

| Lake Evaporation (A) |               | Precipitation (B) | A Minus B ==<br>Net Evapotranspiration |
|----------------------|---------------|-------------------|----------------------------------------|
| Roanoke, V           | irginia       |                   |                                        |
| JAN                  | 0.95          | 3.12              | NIL                                    |
| FEB                  | 1.39          | 2.86              | NIL                                    |
| MAR                  | 2.55          | 3.53              | NIL                                    |
| APR                  | 3.55          | 3.10              | 0.45                                   |
| MAY                  | 4.42          | 3.79              | 0.63                                   |
| JUN                  | 5.10          | 3.80              | 1:30                                   |
| JUL                  | 5.19          | 4.25              | 0.94                                   |
| AUG                  | 3.39          | 4.63              | NIL                                    |
| SEP                  | 3.36          | 3.26              | 0.10                                   |
| OCT                  | 2.50          | 3.21              | NIL                                    |
| NOV                  | 1.23          | 2.70              | NIL                                    |
| DEC                  | 0.84          | 2.98              | NIL                                    |
| Albuquerqu           | e, New Mexico |                   |                                        |
| JAN                  | 1.76          | 0.41              | 1.35                                   |
| FEB                  | 2.39          | 0.38              | 2.01                                   |
| MAR                  | 4.09          | 0.48              | 3.61                                   |
| APR .                | 6.11          | 0.47              | 5.64                                   |
| MAY                  | 7.81          | 0.75              | 7.06                                   |
| JUN                  | 9.17          | 0.57              | 8.60                                   |
| JUL                  | 8.58          | 1.20              | 7.38                                   |
| AUG                  | 7.42          | 1.33              | 6.09                                   |
| SEP                  | 6.36          | 0.95              | 5.41                                   |
| ост                  | 4.30          | 0.75              | 3.55                                   |
| NOV                  | 2.38          | 0.38              | 2.00                                   |
| DEC                  | 1.64          | 0.46              | 1.18                                   |

#### Table 2. How to Estimate Assist From Evapotranspiration.

27

Source: Data from Final Report, Research Study on Sewage Disposal Through Evapotranspiration of Plants, prepared for National Association of Home Builders Research Foundation, Inc. by Engineering-Science, Inc., 1971, Chapter III and Appendix A. that the materials for the basin floor should be so nearly impervious as to preclude excessive loss of liquid. [9] The relatively impervious soil material should be at least four feet thick. This is especially important where the local water supply comes from shallow wells that may become contaminated.

**Slope.** Slope must be low enough and soil material thick enough over bedrock to make smoothing for uniformity of lagoon depth practical. Greater slope is allowable if soil material is more than six feet deep, but generally smoothing is impractical where slope is more than 7 per cent. If the soil is nearly level and therefore requires little or no smoothing, it need not be more than four to six feet deep.

**Flooding.** Floodwaters must not overtop embankments because they interfere with functioning of the lagoons and carry away polluting sewage before sufficient decomposition has taken place. Ordinarily, therefore, places susceptible to flooding should not be used for sewage lagoons. If, however, floodwaters are slow-flowing and rarely (if ever) more than about five feet deep—not deep enough to overtop lagoon embankments—flooding will not be a problem.

**Depth to Water Table.** Depth to water table can be disregarded if the lagoon floor consists of soil material at least two feet thick that is impermeable or nearly so; but if the material is permeable, even if no more than slowly permeable, depth to water table is critical. Unfiltered wastewater should not be allowed to contact ground water. It is best if the water table is below a depth of sixty inches at all times. If the water table seasonally rises to depths between forty and sixty inches, a hazard exists. If it rises to a depth less than forty inches for an extended period, a serious hazard exists.

**Other Soil Properties.** Soils containing moderate to high amounts of organic matter are unsuitable for the basin floor even if the floor is underlain by suitable soil material. The organic matter promotes growth of aquatic plants, and they are detrimental to proper functioning of the lagoon.

Soils that contain fragments more than ten inches in diameter are undesirable as sites for sewage lagoons because such fragments interfere with the manipulation and compaction needed to prepare the basin floor.

#### The Rating of Soils for Use as Lagoon Sites

The guide used by the Soil Conservation Service to rate soils for sewage lagoons is shown in Table 3.

# The Role of Soils in Wastewater Disposal

|                                                                                           | Degree of soil limitation |                       |                                      |  |  |  |
|-------------------------------------------------------------------------------------------|---------------------------|-----------------------|--------------------------------------|--|--|--|
| Item affecting use                                                                        | Slight                    | Moderate              | Severe                               |  |  |  |
| Depth to water table<br>(seasonal or year-round)                                          | More than 60 in.          | 40-60 in.*            | Less than* 40 in.                    |  |  |  |
| Permeability                                                                              | Less than 0.6<br>in./hr.  | 0.6-2.0 in./hr.       | More than 2.0<br>in./hr.             |  |  |  |
| Depth to bedrock                                                                          | More than 60 in.          | 40-60 in.             | Less than 40 in.                     |  |  |  |
| Slope                                                                                     | Less than 2%              | 2-7%                  | More than 7%                         |  |  |  |
| Coarse fragments, less than 10 inches in diameter; percent, by volume                     | Less than 20%             | 20-50%                | More than 50%                        |  |  |  |
| Percent of surface area covered by<br>coarse fragments more than 10 inches<br>in diameter | Less than 3%              | 3-15%                 | More than 15%                        |  |  |  |
| Organic matter                                                                            | Less than 2%              | 2-15%                 | More than 15%                        |  |  |  |
| Flooding †                                                                                | None                      | None                  | Soils subject to<br>flooding         |  |  |  |
| Soil groups (Unified) ‡ (rated for use<br>mainly as floor of sewage)                      | GC, SC, CL, and<br>CH     | GM, ML, SM,<br>and MH | GP, GW, SW, SP,<br>OL, OH, and<br>PT |  |  |  |

#### Table 3. Soil Limitation Ratings for Sewage Lagoons.

\*If the floor of the lagoon is nearly impermeable material at least two feet thick, disregard depth to watertable.

†Disregard flooding if it is not likely to enter or damage the lagoon. (Low velocity and the depth less than about five feet.)

‡Unified soil classification system is used mainly for engineering practices.

Source: Guide for Interpreting Engineering Uses of Soil, USDA, Soil Conservation Service, Nov. 1971, p. 27.

# Traditional Approaches to Wastewater Systems Design

# General Planning and Design Criteria

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#### Functions of Sewage Works

Sewage, or wastewater, is defined as just about anything that goes down the drain excreta, washwater, ground garbage, and so forth. The structures and equipment which handle and treat sewage are collectively called sewerage or sewage works. Sewers are the conduits that convey sewage to treatment plants. The functions of a sewage works include:

Collection of sewage from the house,

Conveyance of sewage to the treatment site;

Treatment of sewage;

Disinfection of treated effluent; and

Disposal of effluent.

This chapter is concerned with general guidelines for planning and designing systems or important parts of systems for treating wastewater in rural areas. The state-of-the-art for performing these functions is surveyed in Appendix C where representative equipment is shown and described.

The five functions of sewage systems are not always performed in discrete or obvious steps. A properly functioning soil absorption system, for example, provides treatment, removal of infectious agents, and disposal of effluent in a manner that will not endanger the general environment or individual health. The general design criteria in this chapter are, however, organized on a functional basis.

Figure 7 illustrates sewage treatment processes that are generally available to rural communities. They are organized according to three basic approaches: on-site treatment, centralized treatment, and a composite of the two; as well as the extent of treatment—primary, secondary, and tertiary.

#### **Collection and Conveyance of Wastewater**

**Protection within the house.** Wastes from toilets, sinks, baths, and household drains are conveyed through waste lines in the house plumbing to the house sewer. Local,

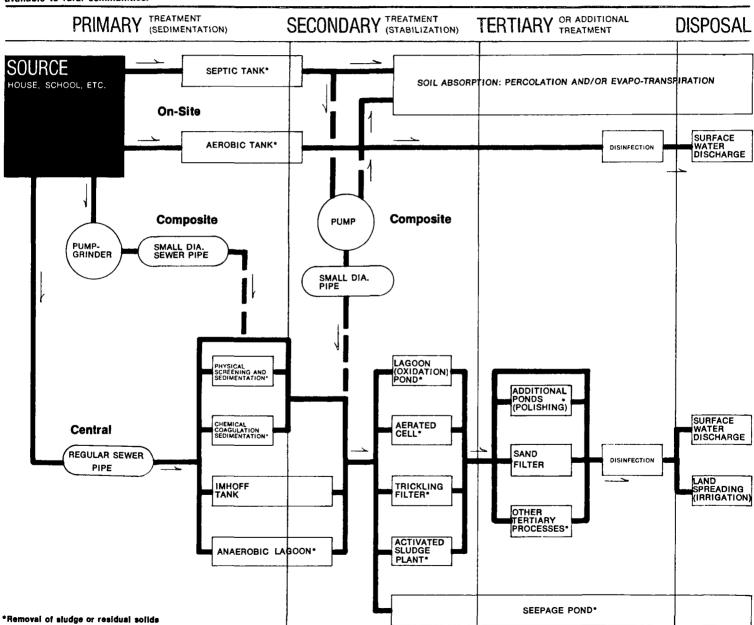


Fig. 7. Sewage treatment processes generally available to rural communities.

state and national plumbing codes provide elaborate specifications of designs, materials and critical dimensions involved in connecting water-using fixtures and appliances to the house plumbing. These codes guard against backflow of wastewater and of gases from decomposing wastes to the fixtures, appliances, or drains and prevent crossconnections (by siphoning or leakage through open joints, for example) between water supply lines and waste lines. The codes should be followed. In some cases, there may be valid reasons for attempting to obtain changes to or variances from local codes (to substitute plastic pipe for pipes made of other traditional materials, for instance).

Once in the receptacles and lines, wastes should not be accessible to the house side of the system. Water traps (the U- or J-shaped waste pipes under sinks and built into toilets) act as barriers between the house and the waste lines. Air gaps in lines and vent pipes protect against back-siphoning of wastes. The vent pipes also provide an alternate means of escape for sewer gases other than into the house. A check valve may be placed in the house sewer to prevent back-up of sewage into the house, but check valves are not commonly found unless specified by code.

**Beyond the house.** Whether the house sewer leads to a septic tank tens of yards away or through a sewer network to a plant many miles away, the capacity of a wastewater conveyance system depends upon the hydraulic head designed into it (either by pitch relative to gravity or by pressure from a pump) and the effective cross-sectional area of the conduit. This area can be reduced by the accumulation of scale, greases, grit and solid debris, and the system should be designed so that the wastewater will attain a self-cleaning, or scouring, velocity—enough speed of flow to keep settleable solids in suspension. The scouring velocity should be attained with sufficient frequency and duration to prevent solids' build-up.

On the assumption that with time solids will build up despite the best design and installation practices, access must be provided for cleanout of sewers. Access, grade requirements, i.e., slope of sewer pipe and other specifications, are normally contained in state or local codes.

Joints should be watertight, and open legs of *T*- or *Y*-connections should be closed off to prevent tree roots from growing through cracks or openings in pursuit of water and to prevent liquids from escaping. In appreciable quantities, escaping liquids can erode the soil and bedding material from around pipes and cause cave-ins. The pipe would then be less able to sustain loads and more subject to breakage. Moreover, stripped of its insulating soil, the pipes would be subjected to damage from freezing. Escaping sewage can also contaminate ground water.

Pipe should be laid at sufficient depth and with proper bedding to protect it from overhead traffic loads, vibrations, frost heaves and other movement of the soil.

The obvious must not be overlooked: the entire sewer system must be mapped in detail, including the locations and types of joints, cleanouts, and manholes. This will permit the

location of faulty sections and the avoidance of sewer lines during excavation for other structures.

Means for venting or otherwise preventing the buildup of explosive sewer gases, such as open manholes, should be designed into the system.

A positive means of signalling failure of all mechanical devices upon which flow depends, such as grinders and pumps at the house and lift stations along the line, should be provided. Lift stations raise the level of sewage when further increases in depths of gravity sewer lines become impractical or when the sewage must be carried over a hill.

If the sewer carries only wastewater, it is called a sanitary sewer. If it carries only runoff from natural sources such as precipitation it is a storm sewer. Sewers which carry sanitary wastes and runoff in the same conduit are called combined sewers. Combined sewers are much more expensive to build (extra size for peak overloads) and to maintain than sanitary sewers. In many sewered areas, runoff is handled by a system of drainage ditches. It is important that storm runoff or flood waters not get into sanitary sewers for reasons of sanitation and to prevent overloading of the sewers and the treatment works.

Seepage of water from saturated soil into sewers is very hard to prevent. Where there is infiltration into the sewer, the opportunity for sewage to seep out also exists. Therefore, sewers should not be run below the water table if possible, and they should be designed to minimize contamination of groundwaters in the event of seepage.

Sewers should also be designed to keep out rodents and insects, both of which act as disease vectors. Because it is virtually impossible to deny these animals entry into storm or combined sewers, they should therefore be designed to make exit difficult. Sewer inlets should also minimize the danger of entry by small children or pets.

# Treatment

Treatment works should be built with sufficient integrity and surge capacity to accept all incoming loads without permitting inadequately treated effluent to escape to the environment. This includes related practices of rodent and insect control and denial of access to farm animals or to the general public (by fences, for example).

Treatment works, whether on-site or central systems, should not be built on land which is subject to flooding. The land should be graded to promote runoff and to divert it away from the treatment works. The soil upon or into which the treatment works are built should be strong enough to support the heavy loads of concentrated volumes of water. The soil should either be adequately sealed or of sufficient thickness to prevent seeping or spilled sewage from reaching ground water.

For central plants, an all-weather road access should be provided not only for repair

vehicles, but for vehicles which remove accumulated solids and sludge. This calls for roads which can support heavy machinery. If the plant is designed to receive the contents of septic tank pumping trucks, adequate washdown and grading for drainage should be installed. Sufficient space for the flow of truck traffic should be provided to minimize both delays and accidents.

Many central plants in rural areas will be scaled down versions of municipal plants. They will have been sold as a "package" of standard components (tanks, pumps, blowers, etc.). It is unlikely that there will be a full time operator. At a minimum, the plant should be provided with failure alarms and a protected place for operating and maintenance logs. The alarms should be capable of working in the event of power loss, since plants are often knocked out by lightning overloads, or downed power lines. The operating and maintenance logs should contain schedules and spaces for recording the results of routine tests, inspections, process adjustments, and service procedures as well as spaces to record all failures, repairs and emergency corrective procedures. The log should be checked regularly by the administrative officers of the operating company as it can both indicate level of performance of the system and warn of impending failures and needs for equipment overhaul or replacement.

Either backup power should be provided (combustion engine generators, for example), or there should be a holding tank or basin capable of detaining sewage flow in the event of prolonged power failure. The tank or basin should be capable of detaining the sewage for a time exceeding the anticipated period of failure. Such provisions could be coordinated with the design of excess or surge capacity to effect overall savings in plant costs. Power failures should not result in the discharge of untreated sewage, and this holds for on-site as well as central systems.

#### Disinfection

Disinfection is a part of the overall treatment process. It is often mentioned separately because it is an add-on process to most plants. As Appendix C points out, disinfection as currently practiced is an iffy procedure. The disinfection apparatus in a small plant rarely works as well as anybody---designer, operator, or user--expects, even when it appears to be operating properly. Disinfection for small systems is a process which could benefit greatly from improved design and development.

At a minimum, dispensers of disinfecting chemicals or germicidal lights should be outfitted with alarms and flow shutdown capabilities when they run out of their chemical charge or otherwise malfunction. If properly sized and serviced (this can be checked in the log), they should not run out of chemicals. Even when the chemicals are in abundant supply, however, tests must be made regularly to ensure that they are being suplied in sufficient concentrations to satisfy the demands of the effluent.

# Disposal

When the treated effluent is disposed to the environment it should be sufficiently converted, disinfected and diluted so that it will not endanger human health or degrade environmental quality beyond acceptable limits. It is the role of state standards to define the point beyond which a discharge can be presumed unacceptable.

Effluent disposal is achieved by evaporation, by percolation through soil and by discharge to watercourses. Effluent should not leave the treatment plant or region of the drainage field in a septic state. Likewise, septic effluent should not be applied to the surface of the ground. (A later section discusses surface spreading of effluents.)

As with the treatment works, the disposal area should not be subject to flooding. Land disposal areas should be at least several feet above seasonally-high ground-water levels. Disposal areas should also be down-gradient from water supply wells or down-stream from surface supply points.

The problem of sludge disposal should also be anticipated in the design of the system. Sewage sludge or solids may be disposed in landfills or composted. They should never be spread on the land without receiving a protective cover of earth. Land disposal areas should be operated in conformance with sanitary landfill standards. Where sanitary disposal is not feasible, combustion or trucking to municipal or regional plants should be explored.

#### Self-Contained Systems

There are several systems which are fairly well contained in a single piece of equipment. For example, an incinerator toilet (described in Appendix C) will collect excreta, convey it to the combustion chamber, and treat and disinfect the waste by burning. Because the unit disposes of liquid and volatile contents to the atmosphere (which could lead to other problems), only an ash of small volume is left for disposal by the homeowner.

The pit privy is another example of a self-contained system. When the pit is nearly full, the privy can be moved to a new location and the pit covered with topsoil.

#### **Basis for Estimating System Size**

All methods of designing a system for treating and disposing of domestic sewage use a common approach. The designer compares the amounts and constituents of sewage (influent) to the amounts and constituents of effluent that can be discharged according to law or other design specifications. The comparison indicates how much of each constituent must be removed from the sewage by the treatment process. With a knowledge of the quantity to be treated and the required treatment efficiency, the designer should, in principle, be able to find in catalogues the unit that comes closest to meeting his needs. This is certainly the approach that can be taken in a preliminary engineering design/feasibility study.

In order to be able to make the straightforward computations referred to above, several estimates of important parameters must be known. This section provides information needed to make these estimates.

**Influent Characteristics.** Volume. Volume generation estimates range from 30 gallons per capita per day (GPCD) to about 100 GPCD. The amount is dependent to some extent on the standard of living of the people involved. For example, higher incomes permit the purchase of water-using appliances such as dishwashers and clothes washers. If sewage production by a house were metered as is water use, it would often be found that water consumption exceeds sewage production. This is because water used for such purposes as lawn watering and car washing is not discharged as sewage.

Convenient aids for estimating sewage flows are included in the Public Health Service's *Manual of Septic Tank Practice*. They are reproduced in Tables 4, 5, and 6.

Note that, according to Table 4, per capita consumption rises as more waste generating devices are put into use. This table can be used to work backwards to estimate flow per fixture. For example, toilets can be estimated as generating 15 to 30 GPCD, and the collection of showers, washbasins, etc., another 15 to 30 GPCD. A home with one bathroom unit and a kitchen sink would probably account for only 40 to 50 GPCD.

Tables 7, 8, and 9 show estimated quantities of sewage flows for a variety of establishments. The tables were compiled by different sources and are included to illustrate that

| Type of Waste             |    |    | Volume |    |     |
|---------------------------|----|----|--------|----|-----|
| Kitchen wastes            | *0 | 7  | 10     | 10 | 15  |
| Toilet wastes             | 15 | 15 | 20     | 25 | 30  |
| Showers, washbasins, etc. | 15 | 18 | 20     | 25 | 35  |
| Laundry wastes            | *0 | *0 | *0     | 15 | 20  |
| Total Flow (gallons)      | 30 | 40 | 50     | 75 | 100 |

Table 4. Estimated Distribution of Sewage Flows. (Gallons per day per person)

\*No wastes from these uses.

 Table 5.
 Sewage Flow from Country Clubs.

 (Gallons per day per fixture)

| Type of Fixture | Volume |
|-----------------|--------|
| Showers         | 500    |
| Baths           | 300    |
| Lavatories      | 100    |
| Toilet          | 150    |
| Urinals         | 100    |
| Sinks           | 50     |
|                 |        |

Table 6.Sewage Flow at Public Parks.(Gallons per day per fixture)

| Type of Fixture | Volume |  |  |
|-----------------|--------|--|--|
| Flush toilets   | 36     |  |  |
| Urinals         | 10     |  |  |
| Showers         | 100    |  |  |
| Faucets         | 15     |  |  |

Source: Manual of Septic-Tank Practice, DHEW Pub. No. (HSM) 72-10020 (Formerly PHS Pub. No. 526), Rev. 1967, pp. 44-45.

the sewage flows shown are indeed estimates and therefore do not always agree from table to table. The designer will have to exercise judgment. Local public health or environmental control authorities should be consulted in order to determine if there are mandatory design criteria for the specific location of the planned installation; these criteria, of course, prevail over any estimates presented here.

| Table 7. | Quantities of  | Sewage Flows.               |  |
|----------|----------------|-----------------------------|--|
| (Gallons | per person per | day unless otherwise noted) |  |

| Type of Establishment                                                                                                                                                                                            | Quantity                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Airports (per passenger)                                                                                                                                                                                         | 5                                 |
| Apartments — multiple family (per resident)                                                                                                                                                                      | 60                                |
| Bathhouses and swimming pools                                                                                                                                                                                    | 10                                |
| Camps:<br>Campground with central comfort stations<br>With flush toilets, no showers<br>Construction camps (semi-permanent)<br>Day camps (no meals served)<br>Resort camps (night and day) with limited plumbing | 35<br>25<br>50<br>15<br>50<br>100 |
| Cottages and small dwellings with seasonal occupancy                                                                                                                                                             | 50                                |
| Country clubs (per resident member)                                                                                                                                                                              | 100                               |
| Country clubs (per non-resident member present)                                                                                                                                                                  | 25                                |
| Dwellings:<br>Boarding houses<br>additional for non-resident boarders<br>Luxury residences and estates<br>Multiple family dwellings (apartments)<br>Rooming houses<br>Single family dwellings                    | 50<br>10<br>150<br>60<br>40<br>75 |
| Factories (gallons per person, per shift, exclusive of industrial wastes)                                                                                                                                        | 35                                |
| Hospitals (per bed space)                                                                                                                                                                                        | 250+                              |
| lotels with private baths (2 persons per room)                                                                                                                                                                   | 60                                |
| Hotels without private baths                                                                                                                                                                                     | 50                                |
| nstitutions other than hospitals( per bed space)                                                                                                                                                                 | 125                               |
| aundries, self-service (gallons per wash, i.e., per customer)                                                                                                                                                    | 50                                |
| Nobile home parks (per space)                                                                                                                                                                                    | 250                               |
| Notels with bath, toilet, and kitchen wastes (per bed space)                                                                                                                                                     | 50                                |
| Notels (per bed space)                                                                                                                                                                                           | 40                                |
| Picnic Parks (toilet wastes only) (per picnicker)                                                                                                                                                                | 5                                 |
| cnic Parks with bathhouses, shower, and flush toilets                                                                                                                                                            | 10                                |
| Restaurants (toilet and kitchen wastes per patron)                                                                                                                                                               | 10                                |
| Restaurants (kitchen wastes per meal served)                                                                                                                                                                     | 3                                 |

 Table 7.
 Concluded.

 (Gallons per person per day — unless otherwise noted)

| Type of Establishment                                                                                                                                              |                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Restaurants additional for bars and cocktail lounges                                                                                                               | 2                     |
| Schools:<br>Boarding<br>Day, without gyms, cafeterias, or showers<br>Day, with gyms, cafeterias, and showers<br>Day, with cafeterias, but without gyms, or showers | 100<br>15<br>25<br>20 |
| Service stations (per vehicle served)                                                                                                                              | 10                    |
| Swimming pools and bathhouses                                                                                                                                      | 10                    |
| Theaters:<br>Movie (per auditorium seat)<br>Drive-in (per car space)                                                                                               | 5<br>5                |
| Travel trailer parks without individual water and sewer hook-ups (per space)                                                                                       | 50                    |
| Travel trailer parks with individual water and sewer hook-ups (per space)                                                                                          | 100                   |
| Workers:<br>Construction (of semi-permanent camps)<br>Day, at schools and offices (per shift)                                                                      | 50<br>15              |

Source: Manual of Septic-Tank Practice, DHEW Pub. No. (HSM) 72-10020 (Formerly PHS Pub. No. 526), Rev. 1967, pp. 43-44.

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| Table 8. | Sewage | Flow | Rate | Estimati | ng ( | Guide.† |
|----------|--------|------|------|----------|------|---------|
|----------|--------|------|------|----------|------|---------|

| Type of Establishment                                                                                                                                                                    | Estimated Flow Rate<br>(Gallons per day)                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Apartments                                                                                                                                                                               | 250 one bedroom<br>300 two bedroom<br>350 three bedroom                                                                                                          |
| Assembly Halls                                                                                                                                                                           | 2 per seat                                                                                                                                                       |
| Bowling Alleys (no food service)                                                                                                                                                         | 75 per lane                                                                                                                                                      |
| Churches (small)                                                                                                                                                                         | 3-5 per sanctuary seat                                                                                                                                           |
| Churches (large, with kitchen)                                                                                                                                                           | 5-7 per sanctuary seat                                                                                                                                           |
| Country Clubs                                                                                                                                                                            | 50 per member                                                                                                                                                    |
| Dance Halls                                                                                                                                                                              | 2 per person                                                                                                                                                     |
| Drive-In Theaters                                                                                                                                                                        | 5 per car space                                                                                                                                                  |
| Factories (no showers)                                                                                                                                                                   | 25 per employee                                                                                                                                                  |
| Factories (with showers)                                                                                                                                                                 | 35 per employee                                                                                                                                                  |
| Food Service Operations<br>Ordinary Restaurant (not 24-hour)<br>24-hour Restaurant<br>Restaurant along Freeway (24-hour)<br>Tavern (very little food service)<br>Curb Service (drive-in) | **35 per seat at 400 ppm BOD<br>**50 per seat at 400 ppm BOD<br>**70 per seat at 400 ppm BOD<br>**20 per seat at 400 pm BOD<br>**50 per car space at 400 ppm BOD |

| Type of Establishment                                               | Estimated Flow Rate<br>(Gallons per day)                       |  |  |
|---------------------------------------------------------------------|----------------------------------------------------------------|--|--|
| Vending Machine Restaurants                                         | *70 per seat at 200 ppm BOD                                    |  |  |
| Hospitals (no resident personnel)                                   | *200 per bed                                                   |  |  |
| Institutions (resident)                                             | *100 per person                                                |  |  |
| Laundries (coin-operated)                                           | *400 per machine plus 12-hour cooling tank                     |  |  |
| Motels                                                              | 100 per unit                                                   |  |  |
| Nursing and Rest Homes                                              | *100 per person                                                |  |  |
| Office Buildings                                                    | 20 per employee                                                |  |  |
| Schools — Elementary                                                | *15 per pupil                                                  |  |  |
| Schools — High and Junior High                                      | *20 per pupil                                                  |  |  |
| Service Stations                                                    | 1000 first bay<br>500 each additional bay                      |  |  |
| Shopping Centers (without food service<br>or laundries)             | 0.1 per square foot of floor space                             |  |  |
| Subdivisions                                                        | 400 per home                                                   |  |  |
| Swimming Pool (average)<br>With hot water shower                    | 3-5 per swimmer (design load)<br>5-7 per swimmer (design load) |  |  |
| Trailer Parks (without service building)<br>(With service building) | 150 per trailer space<br>175 per trailer space                 |  |  |
| Vacation Cottages                                                   | 50 per camper                                                  |  |  |
| Youth and Recreation Camps                                          | 50 per camper                                                  |  |  |

#### Table 8. Concluded.

\*Includes food service waste.

\*\*Aeration tanks for these require 48-hour detention period.

†Flow rates are average rates established by many of the state health departments throughout the United States. Please consult the District Sanitary Engineer in your area for any state or local individual design requirements.

Courtesy Pollution Control, Inc.

#### Table 9. Package Treatment Plant Sizing Data.

| Type of Facility                                                 | Flow Rate<br>(GPCD) | #5 Day B.O.D.<br>(Ibs./capita /day) | Runoff<br>hours | Shock Load<br>Factor |
|------------------------------------------------------------------|---------------------|-------------------------------------|-----------------|----------------------|
| Airports — (per passenger)                                       | 5                   | .020                                | 16              | low                  |
| Airports — (per employee)                                        | 15                  | .050                                | 16              | low                  |
| Apartments — Multiple family                                     | 75                  | .175                                | 16              | med.                 |
| Boarding Houses                                                  | 50                  | .140                                | 16              | med.                 |
| Bowling Alleys - per lane (no food                               | ) 75                | .150                                | 8               | med.                 |
| Campgrounds per tent or travel<br>trailer site central bathhouse | 50                  | .130                                | 16              | med.                 |
| Camps — Construction — (semi-<br>permanent)                      | 50                  | .140                                | 16              | med.                 |

# Table 9. Continued.

| Type of Facility                                                                                                  | Flow Rate<br>(GPCD) | #5 Day B.O.D.<br>(Ibs./capita /day) | Runoff<br>hours | Shock Load<br>Factor |
|-------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------|-----------------|----------------------|
| Camps — Day (no meals served)                                                                                     | 15                  | .031                                | 16              | med.                 |
| Camps — Luxury                                                                                                    | 100                 | .208                                | 16              | med.                 |
| Camps — Resort (night and day)<br>with limited plumbing                                                           | 50                  | .140                                | 16              | med.                 |
| Churches — per seat                                                                                               | 5                   | .020                                | 4               | high                 |
| Clubs — Country (per resident member)                                                                             | 100                 | .208                                | 16              | med.                 |
| Clubs — Country (per nonresident member present)                                                                  | 25                  | .052                                | 16              | med.                 |
| Courts — Tourist or Mobile home parks with individual bath units                                                  | 50                  | .140                                | 16              | med.                 |
| Dwellings — Single — family                                                                                       | 75                  | .170                                | 16              | med.                 |
| Dwellings — Small, and cottages<br>with seasonal occupancy                                                        | 50                  | .140                                | 16              | med.                 |
| Factories — (gallons, per person,<br>per shift, exclusive of industrial<br>wastes. No showers.<br>Add for showers | 25<br>10            | .073<br>.010                        | 8               | high                 |
| Hospitals                                                                                                         | 250+                | .518                                | 16              | med.                 |
| Hotels — with private baths (2<br>persons per room)                                                               | 60                  | .125                                | 16              | med.                 |
| Institutions — other than hospitals<br>(nursing homes)                                                            | 125                 | .260                                | 16              | med.                 |
| Laundromat                                                                                                        | 400                 | varies                              | 12              | high                 |
| Motels — (per bed space)                                                                                          | 40                  | .083                                | 16              | med.                 |
| Motels — with bath, toilet, and<br>kitchen wastes                                                                 | 50                  | .140                                | 16              | med.                 |
| Offices — no food                                                                                                 | 15                  | .050                                | 8               | high                 |
| Parks — Picnic (toilet wastes only)<br>(gallons per picnicker)                                                    | 5                   | .010                                | 8               | high                 |
| Parks — Picnic, with bathhouses,<br>showers, and flush toilets                                                    | 10                  | .021                                | 8               | high                 |
| Restaurants — (kitchen wastes per<br>meal served)                                                                 | 7                   | .015                                | 8-12            | high                 |
| Restaurants — (toilet and kitchen wastes per patron)                                                              | 10                  | .021                                | 8-12            | high                 |
| Restaurants — additional for bars<br>and cocktail lounges                                                         | 3                   | .006                                | 8-12            | high                 |
| Schools — Boarding                                                                                                | 100                 | .208                                | 16              | med.                 |

| Type of Facility                                       | Flow Rate<br>(GPCD) | #5 Day B.O.D.<br>(Ibs./capita /day) | Runoff<br>hours | Shock Load<br>Factor |
|--------------------------------------------------------|---------------------|-------------------------------------|-----------------|----------------------|
| Schools — Day, without cafeterias, gyms, or showers    | 15                  | .031                                | 8               | high                 |
| Schools — Day, with cafeterias, but no gyms or showers | 20                  | .042                                | 8               | high                 |
| Schools — Day, with cafeterias, gyms, and showers      | 25                  | .052                                | 8               | high                 |
| Service Stations — (per vehicle served)                | 12                  | .021                                | 16              | med.                 |
| Shopping Centers — (no food — per sq. foot)            | 0.1                 |                                     | 16              | med.                 |
| Shopping Centers — (per employee)                      | 15                  | .050                                | 16              | med.                 |
| Stores — (per toilet room)                             | 400                 | .832                                | 16              | med.                 |
| Swimming pools and bathhouses                          | 10                  | .021                                | 8               | high                 |
| Sports Stadiums                                        | 5                   | .020                                | 4-8             | very high            |
| Theatres — Drive-In (per car space)                    | 5                   | .010                                | 6               | high                 |
| Theatres — Movie (per auditorium seat)                 | 5                   | .010                                | 6               | high                 |
| Trailer Parks — per trailer                            | 150                 | .350                                | 16              | med.                 |

#### Table 9. Concluded.

Courtesy Pollutrol Technology, Inc.

Strength of Sewage. As described in Chapter One, the efficiency with which a treatment system can purify (oxidize) organic wastes is frequently measured in terms of BOD (BOD<sub>5</sub>) removal. It is important to know how much organic material, again expressed as BOD, is imposed on the treatment plant. For estimating the organic loading, one-sixth (0.17) of a pound of BOD per person per day is generally used. This means that if the wastewaters produced by each person in a day's time were to be purified by nature, about one-sixth of a pound of pure oxygen would be used up in the first five days of the purification process. If the raw wastes are dumped into surface waters, over one pound of dissolved oxygen has to be provided per person per week, else the water will become stagnant. For homes which use garbage grinders, the organic loadings is often estimated about 50 per cent higher, i.e., 0.25 pounds of BOD per capita per day.

If 0.17 pounds of BOD per day are loaded into 100 gallons of water, the resulting wastewater has an average BOD of about 200 mg/l (or ppm); that would be about 300 mg/l if a garbage grinder were used. If one person accounts for 0.17 pounds of BOD per day, but only 50 gallons of wastewater, the resulting wastewater will have a BOD of about 400 mg/l, i.e., it will be "stronger" than when the BOD was distributed over 100 gallons. Table 10 presents estimates derived by a sewage plant manufacturer of daily BOD loadings as well as wastewater volumes and the resultant strength estimates. Note that the  $BOD_s$  of domestic sewage averages 200-400 mg/l.

**One Hundred Gallons a Day Reconsidered.** Though the criteria of 100 GPCD and 0.17 lb. BOD per person per day are generally accepted in the U. S., they are probably

| Table 10. | Suggested Daily Flows and BOD Considerations.* |
|-----------|------------------------------------------------|
|           |                                                |

|                                       |                     |                                       | Pounds BOD<br>Per Person |                            | Ava Sowago                                      |  |
|---------------------------------------|---------------------|---------------------------------------|--------------------------|----------------------------|-------------------------------------------------|--|
| Class                                 | Persons<br>Per Unit | Daily Flow<br>Per Person<br>(gallons) | Avg.                     | With<br>Garbage<br>Grinder | Avg. Sewage<br>Strength,<br>5 day BOD<br>in ppm |  |
| Subdivisions, Better                  | 3.5                 | 100                                   | 0.17                     | 0.25                       | 205                                             |  |
| Subdivisions, Average                 | 3.5                 | 90                                    | 0.17                     | 0.23                       | 220                                             |  |
| Subdivisions, Low Cost                | 3.5                 | 70                                    | 0.17                     | 0.20                       | 290                                             |  |
| Motels, Hotels, Trir. Pks.            | 2.5                 | 50                                    | 0.17                     | 0.20                       | 400                                             |  |
| Apartment Houses                      | 2.5                 | 75                                    | 0.17                     | 0.25                       | 225                                             |  |
| Resorts, Camps, Cottages              | 2.5                 | 50                                    | 0.17                     | 0.20                       | 400                                             |  |
| Hospitals                             | per bed             | 200                                   | 0.30                     | 0.35                       | 200                                             |  |
| Factories or offices                  | per person          | 20                                    | 0.06                     | _                          | 360                                             |  |
| Factories, incl. showers              | per person          | 25                                    | 0.07                     | _                          | 340                                             |  |
| Restaurants                           | per meal            | 5                                     | 0.02                     | 0.06                       | 450                                             |  |
| Schools, Elementary                   | per student         | 15                                    | 0.04                     | 0.05                       | 320                                             |  |
| Schools, High                         | per student         | 20                                    | 0.05                     | 0.06                       | 360                                             |  |
| Schools, Boarding                     | per student         | 100                                   | 0.17                     | 0.20                       | 205                                             |  |
| Swimming Pools                        | per swimmer         | 10                                    | 0.03                     | _                          | 360                                             |  |
| Theatres, Drive-In                    | per stall           | 5                                     | 0.02                     |                            | 450                                             |  |
| Theatres, Indoor                      | per seat            | 5                                     | 0.01                     |                            | 250                                             |  |
| Airports, Employees                   | per employee        | 15                                    | 0.05                     | _                          | 450                                             |  |
| Airports, Passengers                  | pèr passenger       | 5                                     | 0.02                     |                            | 480                                             |  |
| Bars, Employees                       | per employee        | 15                                    | 0.05                     | _                          | 450                                             |  |
| Bars, Customers                       | per customer        | `2                                    | 0.01                     | _                          | 800                                             |  |
| Dairy Plants                          | per 1000# milk      | 100-250                               | 0.56                     | to 1.66                    | 650-2000                                        |  |
| Public Picnic Parks                   | per picnicker       | 5-10                                  | 0.01                     |                            | 250                                             |  |
| Country Clubs, Residents              | per resident        | 100                                   | 0.17                     | 0.25                       | 205                                             |  |
| Country Clubs, Members                | per member          | . 50                                  | 0.17                     | 0.20                       | 400                                             |  |
| Public Institutions<br>(non-hospital) | per resident        | 100                                   | 0.17                     | 0.23                       | 205                                             |  |

\*Consult with your state and local health department or pollution control agency for specific data. Courtesy Suburbia Systems, Inc.

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too high for strictly domestic sewage. Values of 0.08 to 0.12 lb. BOD and 58 GPCD have been suggested as more representative of domestic sewage. In 1969 and 1970, for example, Zanoni and Rutkowski sampled fresh sewage from the Nicholson Meadows Subdivision of Cudahy, in suburban Milwaukee, Wisconsin. [10] The subdivision contained 270 dwelling units, of which 226 were single family homes in the \$24,000 to \$27,000 bracket. The measured per capita loadings of the strictly domestic wastewater were:

| BOD (5-day, 20°C)      | 0.10 lb./person/day |
|------------------------|---------------------|
| Chemical oxygen demand | 0.20 lb./person/day |
| Suspended Solids       | 0.08 lb./person/day |
| Wastewater flow        | 58 GPCD             |
|                        |                     |

Also, Bernhart has derived a design loading of 55 GPCD on the basis of extensive sampling in Ontario, Canada (Appendix A).

(Note too that design criteria for a Japanese septic tank and an aerobic tank described in Appendix C are 0.0287 lb. BOD and 13.2 gal. of water per person per day.) Domestic sewage treatment systems designed on the basis of 0.17 lb. are, therefore, likely to have excess capacity from the start.

#### Sizing of System Components

The key design parameters for sizing a system are: (1) the total water volume (hydraulic) loading, and (2) total BOD (organic) loading. The entire system should be capable of handling all of the hydraulic loading and all of the organic loading plus a reasonable reserve for growth and surges. Surges occur because water is not used uniformly throughout the day and because every now and then more people than average generate sewage—during holiday visits, for example. Peak flow is normally estimated to be about three times normal flow.

If a system is being sized to serve several homes, consideration should be given to making it big enough to accommodate as many more homes as might be expected to hook up within a reasonable (defined mainly in economic terms) amount of time. If the system will initially serve families with low standards of living that could be expected to rise, consideration should also be given to building in excess capacity to accommodate the increased water use that will surely accompany the rise in living standards.

Sewage treatment plants are normally rated on daily capacities, which are, in turn, usually figured on the basis of fairly constant flow. Actual flow occurs unevenly throughout the day, and is usually confined to "runoff" periods of from two to sixteen hours (see Table 9). Many manufacturers recommend increasing the capacity of the plant over the daily-loading capacity by a factor equal to twenty-four hours divided by the runoff period. As an example, consider a sewage plant built to serve a mobile home park with four hundred inhabitants (16-hour runoff period from Table 9 and 50 GPCD from Table 10). The hydraulic loading of 20,000 gpd would be multiplied by the ratio 24/16 (= 1.5), and a 30,000 gpd plant would be recommended. According to the information developed from manufacturer-supplied data (see chapter on costs), the extra 10,000 gpd capacity could be expected to have a purchase cost between \$3,500 and \$13,500. Design alternatives to increased plant size might be explored: some type of holding facility in front of the plant which would smooth out the rate of loading or a plant with a long detention time, such as a 180-day lagoon which would be relatively immune to variations during the day.

As implied by the above considerations, a system should be somewhat oversized, but only enough to provide for the specific excess-capacity requirements that can be reasonably anticipated. The classic safety-factor approach of multiplying anticipated needs by two or three or more should not be used for several reasons:

—Many mechanical units operate efficiently only within limited ranges of their rated hydraulic and organic capacities. A unit twice as big as what is needed could tie the customer to a unit that will never work efficiently and that might never attain the original design performance levels.

-Larger units cost more to buy, more to install, and, often, more to maintain. The customer should only pay for what he needs or is likely to need within the planning horizon.

—Money wasted on things not needed is not available to purchase other needed items. Even with a fixed budget, surplus funds could be used to purchase more complete treatment rather than wasted on excess capacity.

There are, of course, exceptions. For example, a 1000-gallon septic tank often costs so very little more than a 750-gallon unit that the extra expenditure can be justified on the basis of improved performance. Treatment in septic tanks improves with detention time; bigger septic tanks detain a given amount of sewage longer than smaller tanks and therefore provide more complete digestion. In addition, sludge can accumulate for longer times in a bigger septic tank before a pump-out becomes necessary, thus saving on maintenance costs. The largest septic tank obtainable before costs (including transportation) begin to soar should be used. For example, if the volume can be doubled for a 25 per cent increase in total installed price of a septic tank, it could be worth it. There are few hard and fast rules; judgment is required.

Traditional SystemsFrom just about any environmental point of view a privy of sound construction which is<br/>properly maintained represents an excellent solution to the disposal of human excreta.<br/>Many directors of health departments in counties with rural populations would be happy<br/>to see their residents with safe sanitary privies. This book, however, concentrates on<br/>systems for those who prefer water carriage of wastes, such as sinks and flush toilets.<br/>[For descriptions of safe privy-construction and maintenance techniques, see 11 and 12.<br/>Many state and local health departments also publish guidelines on preferred techniques<br/>for privy construction.]

# Water Carriage Systems

Many homeowners who have pressurized water are likely to have indoor plumbing, including flush toilets. The outlets of toilets, sinks, showers and other fixtures normally run into a single pipe which leaves the house. This is the house sewer, which is a solid pipe of at least a four-inch diameter.

The house sewer, or lateral, may then lead to any of three receptacles: (1) directly to a body of water, watercourse or drainage ditch without receiving any treatment; (2) to an on-site treatment plant such as a cesspool, septic tank or aerobic tank; or (3) to a branch sewer of a community collection sewer system which will eventually lead either to a treatment plant or, as is unfortunately the case in many communities, directly to surface waters or drainage ditches without benefit of treatment facilities. Direct discharge of untreated sewage to surface waters, either from individual homes or from community sewerage systems is illegal in most jurisdictions.

#### **On-Site Wastewater Systems**

**Cesspools.** Cesspools and seepage (or leaching) pits are covered open-joint walled pits dug into the soil. Cesspools receive raw sewage from which solids settle to the bottom and undergo anaerobic decomposition. Liquids seep out through the walls of the pit. Some cesspools are connected to seepage pits which receive settled sewage effluent. Septic tanks can also empty to seepage pits. Cesspools and seepage pits are generally more expensive alternatives than their more usual analogues, septic tanks and subsurface soil absorption systems. Also, the pits require deep porous soils to provide sufficient absorption area. Such deep soils with considerably deeper water tables or hardpans are rare occurrences.

**Septic Tanks.** The septic tank and soil absorption system represent the most frequently used on-site water carriage disposal system. On most lots of several acres, there will usually be an adequately-sized area with proper soil conditions for the use of a subsurface soil absorption system large enough to serve a single family. When soils are uniformly good over a large area, it may be possible to operate septic tank systems successfully on lots smaller than one acre. However, people usually build where it suits them and the builder, if he is allowed to do so, installs a septic tank convenient to the house. This is where a great many problems begin.

Many septic tank systems fail because they were not designed properly in the first place: the soil wasn't suitable; or the absorption field was undersized; or the tank was too small for the family; or the whole system was inundated by a seasonally high water table, and so forth.

Septic tank systems may also fail because they are not properly installed. Proper installation means that: (1) soils with appreciable clay content should never be excavated for absorption system construction when they are wet—a wet clay is easily sealed tight

by a digging instrument; (2) construction crews should never walk on the bottoms of trenches or absorption beds; and (3) heavy construction machinery should not be run over a soil absorption system.

Also, careful attention should be paid to insure that a septic tank is not installed backwards (or upside down, for that matter).\*

Good installations of proper tanks may eventually fail, even with the best of use. Poor maintenance can shorten the lifetime drastically, and good maintenance and a few design tricks can add many years to the life of a system. Good maintenance procedures include annual or bi-annual checking of the sludge and scum layers to make sure that they do not occupy too much of the space that is needed for the liquid phase and also to keep the scum or sludge particles from getting out into and clogging the disposal system. A septic tank should be pumped out when the bottom of the scum mat is within three inches of the bottom of the outlet device, or the top of the sludge is within the distances specified in Table 11 of the bottom of the outlet.

|                                      |                                                                    | Liquid D | epth <i>(feet)</i> |    |
|--------------------------------------|--------------------------------------------------------------------|----------|--------------------|----|
| Liquid capacity<br>of tank (gallons) | 2.5                                                                | 3        | 4                  | 5  |
|                                      | Distance from bottom of outlet device to top of sludge<br>(inches) |          |                    |    |
| 750                                  | 5                                                                  | 6        | 10                 | 13 |
| 900                                  | 4                                                                  | 4        | 7                  | 10 |
| 1,000                                | 4                                                                  | 4        | 6                  | 8  |

#### Table 11. Guide for Determining When to Pump Out a Septic Tank.

Locating a septic tank to inspect it is often difficult. Accurate records of septic tank and absorption field location are rarely kept and almost never passed from one homeowner to the next upon transfer of ownership. Many homeowners who have moved from urban areas aren't aware that they are served by a septic tank rather than a sewer. Consequently, most septic tanks are not serviced until there is visible evidence of failure. Then the serviceman may spend many hours trying to find the tank. Septic tank inspection ports should therefore be served by a manway that is extended to grade and terminated with an easily seen and recognizable cover plate. It is also possible to embed two- or three-inch pipe into and through the top of the tank and to extend the pipe several inches above grade, where it should be terminated with a tightly fitting solid end cap. The pipe can be used for sounding the tank to obtain sludge and scum depth information.

"The authors observed a soil absorption system which was constructed with solid-walled sewer pipe instead of perforated drain-field pipe. The only seepage in that field was at the open end of the laterals. The system was reportedly designed by an engineering firm, but no knowledgeable person supervised its installation. On the occasion of the authors' observing the system it was being re-excavated, and the pipe was being replaced with brand new solid-walled sewer pipe because, it was said, "the old pipe leaked at the joints." Somebody failed to realize that the pipe must leak along its length to permit the effluent to get into the ground.

The longer sewage is retained in the septic tank, the more treatment it receives. All else being equal, bigger septic tanks will give more complete treatment. Many authorities recommend multi-compartment tanks to separate fresh from treated effluent. Capacity as well as compartmentalization can be conveniently obtained by using two or more tanks in series. This alternative may be much less expensive than obtaining a custom-made compartmented tank.

The Public Health Service's *Manual of Septic Tank Practice* [5] is often regarded as the most authoritative publication in the field. While it may have some flaws, especially as regards the approach to sizing and constructing soil absorption systems, the Manual is one of the most comprehensive engineering guides available. Most states or counties have their own versions, which differ from the Manual as regards certain minimum dimensions, inspection frequencies and other practices.

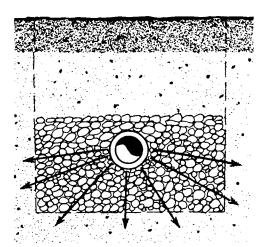
**Aerobic Tanks.** Aerobic treatment tanks are highly scaled-down versions of activated sludge plants. Most use the extended aeration mode. Some are compartmentalized and complex; others are little more than a septic tank supplied with an air bubbler. Many aerobic tanks are described in detail in Appendix C.

Aerobic tanks can, under proper conditions of design, installation and operation, achieve a significantly higher quality effluent than most septic tanks. The effluent can have a lower BOD and suspended solids content as well as a non-zero dissolved oxygen content. The effluent will also contain aerobic microorganisms. Aerobic tanks have been reported to work well in soils that were considered marginal for receiving septic tank effluent. (See, for example, Bernhart's work on aerobic soil systems in Appendix A.) Further, Laak has indicated that smaller soil absorption systems than are required for septic tanks can be used to receive the effluent from aerobic tanks. [13] Several states permit smaller soil systems with aerobic tanks.

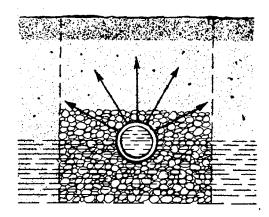
While the evidence in favor of some type of aerobic tanks is impressive, it is far from conclusive, and it is also beclouded by operational difficulties when routine maintenance and service are lacking. For this reason, it is recommended that where on-site treatment is appropriate, septic tank systems be installed. Where the soil is not suited to septic tank effluents, aerobic tanks may be considered, but there is no guarantee that they are suited to all soils either. Other disposal alternatives, such as composite systems and mounds, which are described in the next chapter should be considered for use in difficult situations, perhaps in conjunction with aerobic tanks. It is expected that further use of aerobic tanks and controlled investigations will yield more conclusive evaluations of the advantages of these systems.

# The Soil Absorption System

Effluent from on-site treatment tanks is almost always directed into the native soil through perforated pipes embedded in gravel fill. Seepage pits are often used for soil absorption, but because they must be dug deep to provide the required infiltration sur-



Effluent in a typical subsurface soil absorption system seeps out through holes (or spaces) in the pipe (or tile) and passes through the gravel embedding material and into the soil. Since the bottom of the trench usually clogs, most of the liquid normally seeps through the sidewalls.



The high water table at tile level forces the effluent upward to the surface. This creates an unsanitary condition and health hazard. face area, a system of absorption trenches of equal or better performance can usually be installed for less money. When liquid is infiltered at shallow depths in trenches or beds, a portion can percolate downward and be filtered by the soil before eventually reaching ground waters; some can be pulled up by capillary forces for evaporation from the surface of the ground, and some can be taken up by plant roots and released to the atmosphere by plant transpiration. Liquid which is not filtered by percolation or dissipated by evapo-transpiration will either run down through cracks and fissures in the ground unfiltered or will eventually rise above the ground (daylight) and run off or puddle.

One objective of soil system design is to eliminate residual effluent since it is dangerous and offensive. This objective can be attained if a few important design guidelines are followed. The following factors must be considered.

**Soil Aeration.** The soil should be kept well-aerated and continuous inundation should be avoided. The designer must respect the soil mantle as a living filter, a biological community, as well as a physical strainer and a chemical reactor. If the soil is waterlogged for too long, important soil organisms will suffocate, and the make-up of the biological community will change from aerobes to anaerobes. Aerobes oxidize wastes and keep soil pores open; anaerobes break down wastes less completely and one way or another give rise to soil-clogging processes.

**Depth to Rock, Sand or Gravel.** At least four feet of soil material between the bottom of the trenches or seepage bed and any rock formations is normally considered to be necessary for absorption, filtration, and purification of septic-tank effluent. In areas where the water supply comes from wells and the underlying rock is limestone, more than four feet of soil may be needed to prevent unfiltered effluent from seeping through the cracks and crevices that are common in limestone.

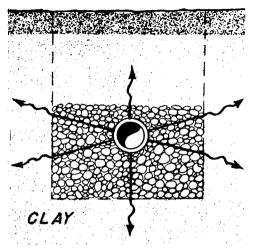
**Different Kinds of Soil.** In some places soil changes within a distance of a few feet. Having different kinds of soil in an absorption field is not significant if the different soils have about the same absorption capacity. But it may be significant if the soils differ greatly. Where this is so, serial distribution of effluent is recommended so that each kind of soil can absorb and filter effluent according to its capability. (The sketch on page 49 illustrates the serial distribution arrangement on a steep slope.)

**Ground Water Level.** In some soils the ground-water level is a foot or a few feet below the surface the year round. In other soils the ground-water level is high only in winter and early spring. In still others, the water level is high during periods of prolonged rainfall. A sewage absorption field under any of these conditions will not function properly; it will also contaminate the ground water, a precious resource whose protection is too often overlooked.

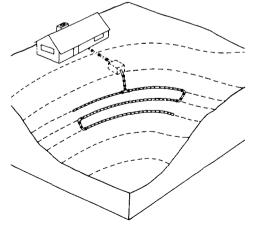
If the ground-water level rises to the subsurface tile or pipe, the saturated soil cannot absorb effluent. The effluent remains near the surface or rises to the surface and the area becomes a foul-smelling, contaminated mudfield.

48

#### **Traditional Approaches to Wastewater Systems Design**



Septic-tank effluent moves into compact, plastic soil very slowly. Such soils should not be used for absorption fields.



Serial distribution recommended for a soil absorption system located along the contours of a steep slope. **Soil Permeability.** Soil permeability is influenced by the amount of gravel, sand, silt, and clay in the soil; the kind of clay; and other factors. Water moves faster through sandy and gravelly soils than through clayey soils.

Some kinds of clay expand so much when wet that the pores of the soil swell shut. This slows water movement and reduces the capacity of the soil to absorb septic-tank effluent.

**Slope.** Slopes of less than 15 per cent usually do not create serious problems in either construction or maintenance of an absorption field provided the soils are otherwise satisfactory.

On sloping soils the trenches must be dug on the contour so that the effluent flows slowly through the tile or pipe and disperses properly over the absorption field. Serial distribution is advised for a trench system on sloping ground.

On steeper slopes, trench absorption fields are more difficult to lay out and construct and seepage beds are not practical. Furthermore, controlling the downhill flow of the effluent may be a serious problem. Improperly filtered effluent may reach the surface at the base of the slope, and wet contaminated seepage spots may result.

On a steep slope, if there is a layer of dense clay, rock, or other impervious material near the surface and especially if the soil above the clay or rock is sandy, the effluent will flow above the impervious layer to the surface of the slope and run unfiltered down the slope.

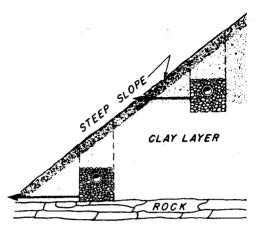
**Proximity to Streams or Other Water Bodies.** Local regulations generally do not allow absorption fields within at least fifty feet of a stream, open ditch, lake, or other watercourse into which unfiltered effluent could escape.

The flood plain near a stream that is subject to flooding should not be used as an absorption field. Occasional flooding will impair the efficiency of the absorption field; frequent flooding will destroy its effectiveness.

**Soil Absorption Capacity.** Knowing the absorption capacity of the soil also helps determine the size of absorption field. The slower the rate of absorption, the larger the field required. If the soil has too slow a rate of absorption, local ordinances may prohibit installing a sewage system and thus prevent building a house. And some soils, regardless of the size of the lot, are not suitable for use as an absorption field.

**Sizing A Soil Absorption System.** The soil system should be sized on the basis of expected loading and the capacity of the particular soil for accepting the liquid. There are many formulas for sizing a soil system to treat and dispose of septic tank effluent. The approach is not an exact science and there is much room for interpretation. The basic design objective is to distribute a well-settled effluent uniformly over a sufficiently

49



50

If an absorption field is placed on a steep slope where there is a layer of dense clay, rock, or other impervious material near the surface, the effluent will flow above the impervious layer to the surface and run unfiltered down the hillside. large surface of soil. The loading of each unit area of soil surface must not exceed the capacity of the surface layer to process and pass the effluent, nor must it be greater than what the bulk soil behind the interface can handle day in and day out. In an attempt to simplify the design concepts, meaningful parameters like gallons/square foot/day or inches/square foot/day have often been replaced with surrogate parameters like number of bedrooms in the house which is to be served by the on-site system. The following procedure for determining the size of the system is recommended:

1. Check with local authorities and determine whether or not there is a prescribed way of doing things; if there is room for judgment, continue.

2. Estimate how much wastewater will be generated on a daily basis and add a bit of leeway for peak use periods. Also, build in reserve capacity if loading can be expected to increase in the future.

3. If absorption fields have traditionally worked well in the area, and if the soil, topography, and geology are similar to the conditions where septic tanks have been working well, be guided by local experience and scale up or down on the basis of expected loading.

4. If there hasn't been much experience with conditions similar to the site being considered, the loading rates suggested in Table 12 may be used as a guide.

5. If there has been a history of soil system failures in the area for conditions similar to the site being considered, use McGauhey and Winneberger's "most conservative" design criterion of 0.03 ft./day (equivalent to 4 square feet/gallon/day) for a loading rate. [14]

| Percolation Rate<br>(minutes/inch) | Maximum loading rate<br>(gal./sq. ft.*/day) |  |
|------------------------------------|---------------------------------------------|--|
| 1 or less                          | 2.5                                         |  |
| 2                                  | 2.0                                         |  |
| 3                                  | 1.6                                         |  |
| 4                                  | 1.4                                         |  |
| 5                                  | 1.3                                         |  |
| 10                                 | 1.0                                         |  |
| 20                                 | 0.72                                        |  |
| 30                                 | 0.48                                        |  |
| 40                                 | 0.42                                        |  |
| 60                                 | 0.36                                        |  |
| over 60                            | 0.25 — "most conservative" approach         |  |

### Table 12. Guide for Estimating Loading Rates of Soil Absorption Systems.

\*Active infiltration surfaces are sidewalls of disposal trenches.

Source: J. T. Winneberger, Private Communication, Nov. 1972.

#### Traditional Approaches to Wastewater Systems Design

6. Remember that even the most-conservative criterion will not get water through a completely impermeable soil; nor does it say anything about whether there's enough bulk soil behind the soil interface to provide adequate renovation; it merely tells how much surface area you need to get the wastewater into the soil with continued use.

7. The required sidewall area of trenches is the daily loading (e.g., gal./day) divided by the acceptable loading rate (e.g., gal./sq. ft./day). If a bed is used rather than trenches, more area will be required (400 gal./day  $\div$  0.48 gal./sq. ft./day, for example, calls for about 830 sq. ft. of sidewall which can be provided with 208 linear feet of 2-foot deep trench). It would require more than 830 sq. ft. of bed surface to dispose of the 400 gal. load.

8. Make sure there's enough good land left to install another absorption field should the first one fail. A much better solution is to install both absorption fields at the outset when all the construction equipment is already on-site and available, and use a diversion valve (see Appendix C for an example) to alternate use between the two fields on a yearly basis. The combined lifetime could turn out to be much greater than the sum of lifetimes of two separate fields each operated until failure.

Actually, the alternating use of dual fields is recommended as part of the most-conservative approach and its value is recognized by a number of health departments. Sidewalls (vertical surfaces) are considered to be more efficient absorption surfaces for continuous service than beds (horizontal surfaces). The suggested sizing procedures discount trench bottom areas entirely. If a bed is used, it should have more than the area recommended for trench sidewall, but how much more is hard to say. In either case, much depends on the quality of the effluent (more stabilized and oxygenated effluent from aerobic tanks is said to require less absorptive surface than septic effluent); the degree of aeration maintained in the soil; and the contribution of evapotranspiration to dissipating some of the liquid. Bernhart's approach to soil-system sizing in Appendix A is based on the quality of the effluent and the degree of aeration of the soil. His recommended loading rates lie closer to the most-conservative approach than to the numbers in Table 12.

**Uniform Loading of the Soil System.** It is important that the soil be loaded uniformly to maintain continuous operations. However, it is virtually impossible to load the soil uniformly with drain tile or perforated pipe because the openings in the pipe are so big that the effluent all runs out in the first third or so of trench length. With time, effluent eventually reaches the far end because the bottom clogs progressively down the length of the trench. If the effluent is applied in large doses by means of a siphon or pump—a day's worth or more at a time—more-even distribution down the length of the field may be possible. Winneberger has suggested pumping the effluent under pressure through small plastic pipe with holes drilled in it. The small pipe should be inserted concentrically in the large drainfield pipe for protection.

**Using Land Management to Ease the Load on the System.** The ground surface over a bed or trench should be slightly arched upward to promote runoff of precipitation. Drainage and diversion trenches and grading should be used to shield the entire onsite system area from as much runoff as possible. These measures will lessen the loading on the system from natural precipitation and reserve maximum capacity for handling effluent.

Shrubs planted around the soil absorption area will also add to the evapotranspirative capability. Some authorities counsel that trees should not be planted too close to the beds or trenches lest their roots grow into the distribution lines; others maintain that tree roots grow into the gravel area but do not disturb pipes because there is plenty of moisture and less resistance to growth in the gravel bed proper. Local agronomists should be consulted about the behavior of locally-suited plant species.

**Filled Land Not Suitable for Absorption.** A drainage field should not be constructed on recently filled land. Soil texture is a property of the distribution of different sizes of soil particles, and structure relates to the way the particles agglomerate to form pores, clods and channels. Both texture and structure are important determinants of a soil's ability to handle liquids. Even if a soil fill of proper texture is used, the structure will have been destroyed by the excavation and filling operations, and it can take years for the structure to be reestablished. Where it is necessary to use fill material (see, for example, a subsequent section on absorption mounds), the fill should never be compacted, because compaction will close the pores. As water percolates through an unsettled fill it will carry along some of the fines (the smallest particles). The fines may be deposited in the pores at the interface between the fill and the native soil, resulting in partial blockage. This can be minimized by avoiding abrupt changes in soil texture between fill and native soil (by installing the fill in layers of different texture, for example) and by ensuring that the pores of the native soil have not been sealed off—by roughening the surface, avoiding digging a wet clay soil, and so forth.

Water Softener Backwash Can Ruin the Soil Field. Soils used for effluent disposal can be harmed by waters backwashed from water softeners. The clay components of soils are made structurally stable in part by the electrical charges on their constituent ions, especially calcium and magnesium ions.\* Water softener backwash brine contains high concentrations of sodium ions, and these exchange places with calcium and magnesium ions in the clay matrix. The exchanging of ions changes the forces that hold the clay together and cause it to lose its structure—the clay becomes tighter and seals.

#### **Centralized Community Wastewater Treatment Systems**

Traditional approaches to the design of centralized systems usually include a collection of sewers which converge toward the treatment plant. The more sparse the population,

\*An ion is an atom or group of atoms that bears a net electrical charge. When table salt dissolves, for example, its sodium atoms become positively charged as they separate from its chlorine atoms. The result is positive sodium ions and negative chloride ions.

the longer the runs of sewer that will be required to serve them. Smith and Eilers derived per capita lengths of sewers in the United States. [15] Close to 1,800 communities with populations less than 500 (average population 387) had about 37 feet of sewer per capita, over 5,000 communities with populations between 1,000 and 5,000 (2,304 average population) had about 26 feet per capita; 1,200 communities with populations between 10,000 and 25,000 (average size 12,920) had about 19 feet of sewer per capita; and 145 communities of over 100,000 population (average population 511,212) were able to serve their residents with about 9½ feet per capita. The national average was 14.3 feet per capita (2 billion feet of sewer serving 140 million people).

Conventional sewers are normally an expensive component of a system. With sewer costs in the \$15 to \$20 per foot range (see chapter on costs) and about 20 feet more sewer per capita than the national average, smaller communities pay a premium of some \$300 to \$400 per capita for sewers. Under these circumstances, economics would seem to argue heavily in favor of small cluster or on-site disposal systems for sparsely-populated areas. Small central systems can also be built according to some fairly new designs at significantly reduced costs (see section on composite systems in the following chapter).

General planning and design criteria have already been presented for collection and conveyance components of a conventional central system. Specific design criteria may be found in a variety of sources. [For example, see 16.] Also, state agency design criteria should be obtained prior to undertaking project design.

**The Treatment Plant.** Large municipal plants may be custom-designed to meet the particular flow patterns and wastewater characteristics of the communities they serve. Each of the individual process components, such as sedimentation or stabilization, is likely to be served by special equipment which reflects the latest advances in process engineering. Thus, very large plants are not usually very much alike.

At the small community level, however, plants will normally be purchased as a package of fairly standard items. Manufacturers normally scale the package up or down, depending on design volume, without varying the basic designs or layouts appreciably. The following discussion highlights some of the important process variables to look for in evaluating plant design, though the purchaser will normally not have much choice among the options offered in the package.

**Design Flow and Loading Rate.** It has been noted that most of the flow from subdivisions will occur during a sixteen-hour period, say from around 7:00 a.m. to 11:00 p.m. Peaks of about three times normal flow will also occur. If a plant is chosen strictly on the basis of daily-load capacity, the treatment efficiency is likely to suffer for several reasons. First, the biological mass of the sludge is sensitive to surge loadings the degree of sensitivity is dependent on the process. Second, and perhaps more important, the clarifier, or chamber in which the sludge settles and from which the clear supernatant is allowed to overflow, has flow limits above which there will be a high carry-over of solids. Conventional activated sludge plants are sensitive to shock loads of food for the microorganisms. When a surge of food comes in and there isn't enough free oxygen around for its conversion, some microbes will get oxygen by converting nitrates to nitrogen gas. The nitrogen gas will make the sludge flocs more buoyant, and they will rise and overflow the clarifier—the plant "belches."

Sustained high loadings, especially during the start-up of a new plant, can so overfeed the culture of microorganisms that they will bloat and not form dense flocs. The light-weight flocs won't settle well, and they will also flow out with the effluent. This process is called *bulking*. Either by belching or by bloating, the plant will lose some of the biomass that is needed for treatment of sewage, and treatment efficiency will fall. At the same time, the BOD and suspended solids in the effluent will rise beyond acceptable limits. This is detrimental to the functioning of soil absorption systems and to the purity of receiving waters.

The objective is to keep the plant on a steady loading schedule and not overload it. This is much easier to accomplish in big plants than in small plants because big ones not only have the smoothed loading which results from an averaging over many individual users, but big plants also have process monitors and operators to control flow rates, aerator rates, chemical inputs, and so forth. As noted in an earlier section, some manufacturers recommend the use of plants which are oversized with respect to total daily-loading rates in order to accommodate peak rates and non-uniform loading patterns. Other manufacturers have designed for the non-uniformity of loading patterns by employing discrete batch rather than continuous flow-through processes. As long as the batch size is capable of handling peak loadings without having to overflow or bypass the plant, the batch-design plant is of adequate size. Designers may modify flow-through plants to include some elements of batch processing by metering sewage from a large holding or surge tank which can also double as a primary treatment tank.

Process Parameters for Activated Sludge Processes. The conventional activated sludge process and the contact stabilization and extended aeration modifications differ in several process parameters. They are compared in Table 13, which shows normal ranges or average values. It should not be interpreted as a prescriptive standard. The conventional and contact stabilization plants maintain a culture which is about 3.5 times the size of the applied BOD load, i.e., the mean sludge residence time, or "sludge age." is about 3.5 days. The extended aeration plants maintain very mature cultures with sludge ages normally in excess of ten days, i.e., the circulating sludge has over ten times the weight of the influent BOD. That way, the extended aeration plants are less sensitive to small variations, but their cultures can be easily starved if food is withheld. It also takes a bit longer to reach process maturity in an extended aeration plant because of competition between adding large loads to build up sludge biomass and having to restrain loading in order to avoid bloating which leads to a bulking floc. Contact stabilization plants are also more able to handle shock loads than conventional plants. The excess handling capacity results from the high degree of aeration of the microorganisms in the re-aeration, or stabilization, zone.

The extended aeration plants require about three times more air per pound of BOD removal, but since they take about three times longer to remove the BOD, blowers of about the same capacity may be used. Where more than one blower is used, at least two-thirds of the aeration requirements should be met with the largest temporarily out of service. The air should be filtered before passing through the aeration device (diffuser, bubbler) because aerators partially blocked by accumulated oil and particulate matter require more electrical power to get the required air through, and fully plugged aerators require shutdown and repair. The dust content should be less than 0.10 mg per 1000

| Process Parameters                                                 | Conventional<br>Activated<br>Sludge | Contact<br>Stabilization<br>Modification | Extended<br>Aeration<br>Modification |
|--------------------------------------------------------------------|-------------------------------------|------------------------------------------|--------------------------------------|
| Air Requirements (20 C, latm.<br>pressure)                         |                                     |                                          |                                      |
| Cubic feet per pound of BOD removed                                | 700-1000                            | 700-1000                                 | 2000-3000                            |
| Cubic feet per gallon of wastewater<br>treated                     | 0.5-1.25                            | 0.5-1.25                                 | 2-3                                  |
| BOD Loading                                                        |                                     |                                          |                                      |
| pounds per day per 1000 cubic feet<br>of aeration tank(s) capacity | 30-40                               | 30-50 (higher in some cases)             | 12.5                                 |
| pounds per day per 100 pounds<br>mixed liquor solids               | 35                                  | 30-40                                    | 5-10                                 |
| sludge age (mixed liquor solids<br>divided by BOD loading) days    | 3.5                                 | 3.5                                      | >10                                  |
| Mixed liquor Suspended Solids                                      |                                     |                                          |                                      |
| milligrams/liter                                                   | 2500                                | Contact zone:<br>2000-3000               | 2500-6000<br>(~ 4000 optimum         |
|                                                                    |                                     | <i>Stabilization zone:</i><br>5000-8000  |                                      |
| Aeration Period                                                    |                                     |                                          |                                      |
| Hours                                                              | 6-8                                 | Contact zone:<br>0.5-1.5                 | 24                                   |
|                                                                    |                                     | Stabilization zone:<br>4-5               |                                      |
| Sludge Returned (as percentage of solids loading)                  |                                     |                                          |                                      |
| range                                                              | 15-75                               | 50-150                                   | 50-200                               |
| average                                                            | 30                                  | 100                                      | 100                                  |

 Table 13. Comparison of Process Parameters for Conventional Activated Sludge Process,

 Contact Stabilization Modification, and Extended Aeration Modification.

cubic feet of filtered air to minimize clogging. The air should not contact lubricating oil in the pumps.

Conventional plants must dispose of (or "waste") about 70 per cent of their sludge, while extended aeration plants normally have to waste little sludge. Extended aeration plants will normally have to be emptied of accumulated sludge only two to three times per year—a big operational and maintenance advantage.

Contact stabilization plants require solids control in two chambers (contact and stabilization) as opposed to one (the aeration chamber) in conventional and extended aeration plants. In general, the extra control makes contact-stabilization plants less amenable to unattended operation and explains why so many of the small activated sludge plants are of the extended-aeration type.

Properly operated activated sludge plants should be capable of 85 to 95 per cent BOD reduction. Extended aeration plants with mature cultures convert nearly 100 per cent of incoming organic loads to sludge biomass. Therefore, most of the BOD that appears in the effluent of a well-designed and properly operated plant will be attributable to the respiration of microorganisms carried over as suspended solids in the effluent. This is why it is so important to have a clarifier of sufficient capacity and design (aided by efficient overflow baffles and surface skimmers) to minimize suspended solids in the effluent. Adequate clarifier capacity will handle surge loads, and proper clarifier design will minimize the overflow of a belched (rising) or bloated (bulked) sludge.

Some localities will require final filters or ponds for "polishing" the effluent. Sand filters used for polishing are not maintenance-free. They will eventually clog unless they are periodically backwashed and they can attract filter flies. While ponds can be an aesthetic asset to a plant and can support aquatic life, they do, however, require space and the extra land can be costly.

## Alternate Approaches to Wastewater Systems Design

The unusual approaches to the design of rural wastewater treatment systems included in this chapter are recommended for use where traditional solutions are not feasible. They are in keeping with the spirit of providing environmentally safe and effective treatment alternatives at reasonable cost. Included are engineered above-ground mounds and subsurface evapotranspiration systems, which may be appropriate for use when the native soil is not suited for conventional effluent absorption; the use of small-diameter pressure sewer systems for sparsely populated communities in order to bring the per capita cost of sewering in rural areas within striking distance of conventional urban gravity sewers; and the return of treated wastewater to the ground by spray irrigation techniques as an alternative to disposal to surface waters.

Above-ground Mounds for the Disposal of Effluent Disposal of Effluent Disposal of Effluent There are at least two approaches for providing soil treatment where the native soils are not suitable for accepting effluent from sewage treatment tanks—where, for example, shallow soils are underlain by hardpan, creviced or channeled rock, or there is a high ground water table. One approach uses a specially engineered artificial soil bed designed to dispose of liquid by evapotranspiration. It is described in the section which follows. The other approach uses above-ground mounds.

> Mounds were developed in North Dakota and are often called NODAK systems in recognition of their origin. They were described at least as early as the 1950's by Salvato. [12] The success of mounds in the extreme environments of North Dakota augers well for their general applicability. Presumably, in the extreme winter environments, evapotranspiration is maintained in part by evergreen plantings.

> The design of a successful mound requires a firm understanding of the principles of movement of liquids through soils because a mound must be custom-designed to the particular soil conditions. Mounds are constructed from soil, sand, and gravel which are trucked to the disposal site. Effluent is pumped up to absorption trenches or to an absorption bed located in the interior of the mound. If the terrain slopes properly, it may be possible to build the mound downslope of the sewage treatment tank and thereby

avoid the need for a pump. Mounds are normally trapezoidal in cross-section with the wider dimension at the base. (See Figure 8.) The absorption trenches or bed are no wider than the top of the trapezoid, and the tapered sides serve to divert precipitation from the mound and to help contain effluent within the mound area. The top of the mound is arched upward slightly to aid in runoff diversion also. The top and sides of the mound are normally planted in grass to increase evapotranspiration from the mound and to reduce erosion of the mound by wind and rain. Similarly, the border may be planted with shrubs or trees. Care must be exercised to prevent growth of roots into the sewage distribution pipes.

Effluent entering the mound receives treatment in the mound soil just as it does in properly suited native soil. Much of the moisture may be removed by evapotranspiration, and the remaining liquids are expected to infiltrate the native soil beneath the mound without daylighting. Infiltration into the native soil is enhanced by the trapezoidal geometry which provides a much greater ground contact area than the bottom area of the trenches alone.

At least one health department has provided design standards for mounds—a handout from the Monroe County, New York, Department of Health is reproduced in Figure 9.

#### **General Design Criteria**

There are two key features of mound design: (1) there should be about two feet of suitable soil, preferably a sandy loam or a loam, between the bottom of the soil absorp-

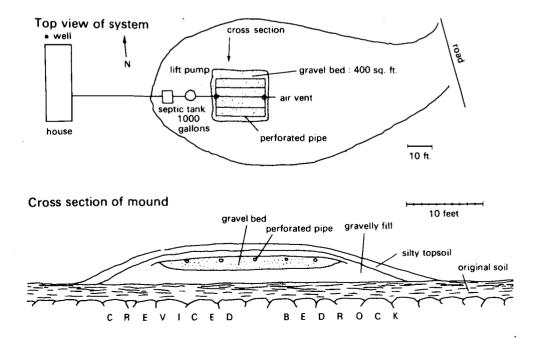
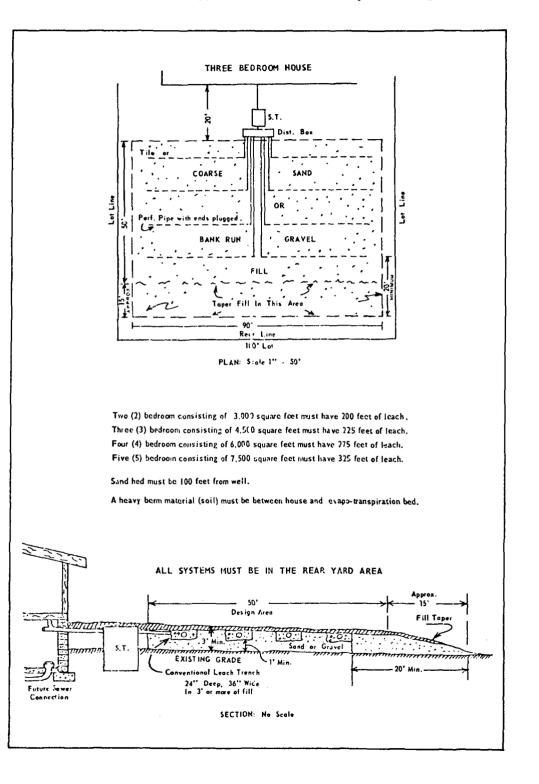


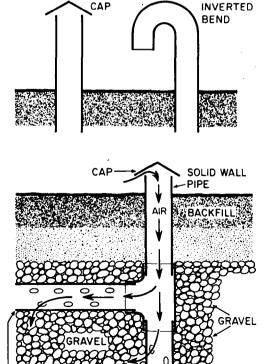
Fig. 8. Top view and cross section of above ground mound. Source: J. Bouma, W. A. Ziebell, W. G. Walker, P. G. Olcott, E. McCoy, and F. D. Hole, Soil Absorption of Septic Tank Effluent, A Field Study of Some Major Soils in Wisconsin, Information Circular No. 20, Geological and Natural History Survey, Madison, Wisc., 1972.



tion bed or trenches and the native topsoil, and (2) effluent should be applied as uniformly as possible over a sufficiently large soil absorption system in the mound. A sandy loam or loam will provide the best hydraulic flow and filtering characteristics for effluent percolating downward. At the same time the sandy loam or loam will be efficient in drawing liquid to the outer surfaces of the mound by capillary forces, and will thus contribute to evaporation of water from the mound. Two feet of unsaturated sandy loam will provide a transit time of from twenty-four to forty-eight hours, which will greatly enhance the degree of renovation of the wastewater before it reaches the native soil. [17]

The second major design criterion is closely related to the first. Uneven distribution of effluent can result in saturation and too rapid percolation through the fill soil in regions of concentrated application. The renovative capabilities of the soil would then be seriously compromised. Conventional distribution systems (drain tile or perforated fourinch plastic tubing, for example) spread the effluent very unevenly. Winneberger recommends a design in which effluent is accumulated and transported to the distribution lines in the mounds in doses, under positive hydrostatic pressure. The effluent distribution lines are small diameter plastic pipe (one to two inch) in which small smooth holes (about one-eighth inch) are drilled in pairs about every foot. These pipes are placed concentrically in conventional four-inch perforated drainfield pipe with the perforations facing downward. The larger pipe is embedded in the gravel of the absorption bed or trench, as in a conventional subsurface soil absorption system. The larger pipe both protects the small pipe and provides a means of access should repair be necessary. A batch of wastewater, when pumped under pressure to the small tubing, will dose the absorption system much more evenly than it could if it were applied directly to the large pipe. Breezers, or vertical vent stacks are placed at the ends of the lines. The breezers extend above the mound surface and allow air into the trench or bed, thus fostering aerobic conditions. [18]

Most sources agree that the tapered fill sides of the mounds should extend about 20 feet from the upper surface of the mound, i.e., in cross-section, the base of the mound should be about 40 feet wider (20 feet on each side) than the top. Winneberger has described a mound 160 feet long, 3 feet wide at the top, 43 feet wide at the bottom and with the 20-foot taper fill around all four sides. The mound has a volume of 11,500 cubic feet (about 425 cubic yards), neglecting the volume of the soil absorption system. Soil of 30 per cent available void space would offer about 25,000 gallons of potential storage in the mound. An absorption trench one foot wide and two feet deep filled with gravel of 40 per cent void space and running the length of the mound would offer about 960 gallons of storage space, or around three days' volume of effluent from an average home. About 600 to 900 gallons should be pumped (or drained under hydraulic head from a tank located up-slope) into the mound all at once from a dosing tank which follows the septic tank in series. The intermittent dosing schedule is intended to give the soil a chance to rest and recover between loadings. Winneberger also recommends dual side-by-side trenches which are dosed on alternate annual cycles by means of a diversion valve as in the case of subsurface systems. Care should be taken to choose a pump and fittings that will not be corroded by acidic septic tank effluent. The dosing



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tank should be provided with an access port for removal of accumulated solids deposits. [18]

The native ground surface beneath the mound should be cleared of all plants, large rocks and debris prior to construction. The role of the original topsoil is important to the flow regime, and none of it should be removed or compacted prior to construction of the mound. The surface may be broken up with a rototiller and left rough. Since digging or compressing soils when they are wet destroys permeabilities, no construction activity should take place when the soils are wet. The fill material should not be compacted, except for clay barriers which may be used at the base in some designs (see Bouma's approach below). Ideally, the mound material should be allowed to settle in place for several years before the mound is put into service, though it would not be practical to do so in most instances. A natural settling period of several months to a year would be helpful.

#### **Specialized Designs**

Bouma suggests two major approaches to mound design depending upon whether the mound is (1) over slowly permeable soil or hardpan located less than three feet below the soil surface, or (2) over creviced or channeled bedrock within three feet of the soil surface. In the first case, the design objective is to provide a base just wide enough to disperse the wastewater and to permit horizontal flow through the native soil without causing the effluent to daylight as it moves away. This type of mound will normally have a long rectangular shape. The sides of the mound will include a relatively impermeable clay barrier to help force the water down into the native soil and to prevent daylighting through the sides of the mound.

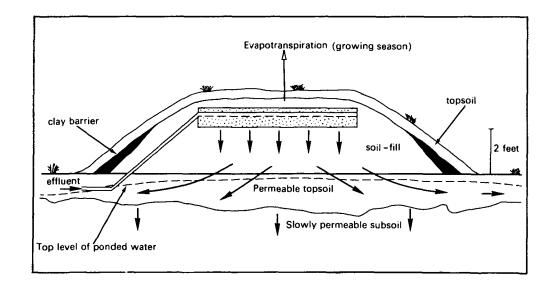
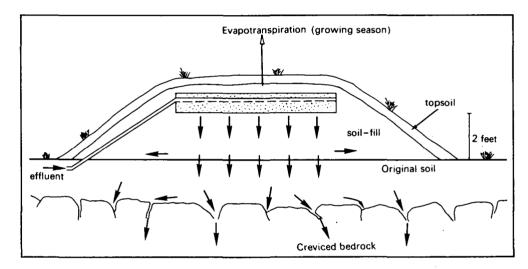


Fig. 10. Mound system over slowly permeable soils within three feet of soil surface. Source: J. Bouma, et al., Soil Absorption of Septic Tank Effluent, A Study of Some Major Soils in Wisconsin, Info. Circ. No. 20, Geological and Natural History Survey, Madison, Wisc., 1972. The design objective for mounds built over soils underlain with shallow-creviced bedrock is to tailor the hydraulic conductivity of the fill to that of the native soil such that flow is gradual, uniform, and even, down to the bedrock. This will presumably permit the wastewater to receive adequate treatment before reaching the channels in the bedrock which can be direct conduits to ground water. This type of mound need not be long and narrow; more pleasing and economical shapes are possible. Figures 10 and 11 illustrate how these mounds are constructed. [Bouma's designs are presently undergoing continued demonstration and testing. For his results to date, see 17.]

Machmeier\* has developed designs for individual mounds for sandy and clay soils. His design specifications for "gopher mounds" are shown in Figures 12 and 13. Note that the mounds incorporate dual-trench systems, which are to be alternated on an annual cycle.



within three feet of soil surface. Source: J. Bouma, et. al., Soil Absorption of Septic Tank Effluent, A Study of Some Major Soils in Wisconsin, Info. Circ. No. 20, Geological and

Natural History Survey, Madison, Wisc., 1972.

Fig. 11. Mound system over creviced bedrock

#### Specially Engineered Subsurface Soil Absorption Systems<sup>†</sup>

Hancor, Inc. has developed several systems which make use of their products for subsurface disposal of septic or aerobic tank effluent. Three of these systems are shown on the following pages.

Their Inverted Channel Air-Flow™ System is a modification of the Sheldon system. The drain holes are laid facing upward so effluent fills the entire length of the lateral before being able to trickle out into the trench. Solids settle out in the tubing, thus reducing the solids loading on the soil infiltration surfaces. The solids are removed periodically by flushing out the system as shown in Figure 14. The inverted system also ensures that effluent will be deposited fairly uniformly along the entire length of the trench. In conventional systems, effluent usually seeps out in the first several feet of the lateral, and only reaches the far end when the soil has become clogged along its length. An improved version of the system places the distribution lines within fifteen inches of the

\*Roger E. Machmeier, Extension Agricultural Engineer, University of Minnesota, Institute of Agriculture, St. Paul, Minnesota 55101. \*Courtesy Hancor, Inc.

Fig. 12. Gopher Mound for Clay Soli. Source: University of Minn., Dept. of Agricultural

Engineering.

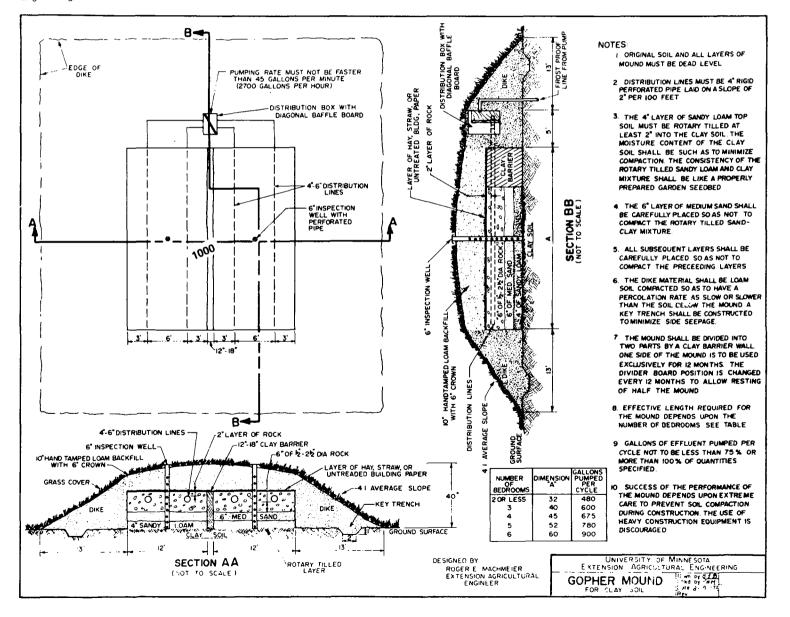
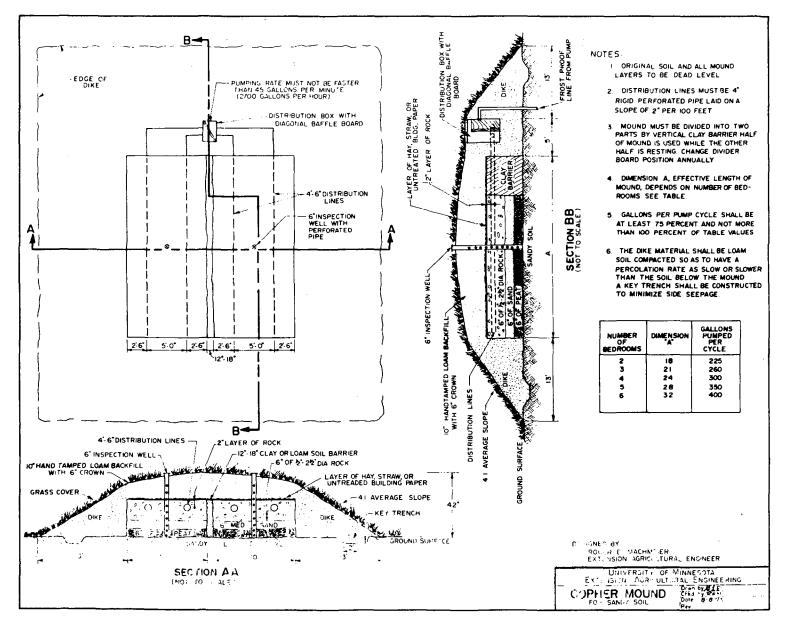


Fig. 13. Gopher Mound for Sandy Soil.

Source: University of Minnesota, Dept. of Agricultural Engineering.



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12.30 TYPE C Sume System. Courtesy Hancor, Inc., Findlay, Ohio. + 12 1 30 Type 1 + b  $\langle \cdot \rangle$ 10 5 XHAUSI 44 (3.90 as in parter and and a make / P HOD CALLS OF AS AS AS C. SS NESS MAY BE FLUSHED OF ULTH GRADEN HOSE. THIS REMOVE S SOLIDS. HÁLLÍ FE. 20+ENC640 75+64 WILLIAM TOTAL MATT GLASS -64 in a support i bas . . . ------- 24 PLASTIC OF VITRIPED SUMPS - 2 and the trun 4 ---- $\bigcirc$ Ο .... ..... -. 19 -H2632 BILL OF MATERIAL HANCOR, INC. FINDLAY, OHIO 45840 · . . . . 72 www.mar.S.m. Sawage VERMEAL A 1.1.1. AND WENT LINE TO MOUSE STACK CARSS SECTION BELOW IS THERE. RECOMMENDED MATERIALS SARY WITH AVAILABRITH AND COST. WENDED Lee cores 6-000 NETER DRAW LINE THE THELE AREAS 1 10:20 Sugar AASTA Terms TYPICAL MOD SO'FT. ALDORN EMPOT INSTALLATION DR AR BLANNART, ATTO AN LANES SAMOL LINES HANCOL INC DOLL BRUCE AND THE CO \_\_\_\_\_i HANCOR BO KINT SISTEM NAL ACTINE TER DOM

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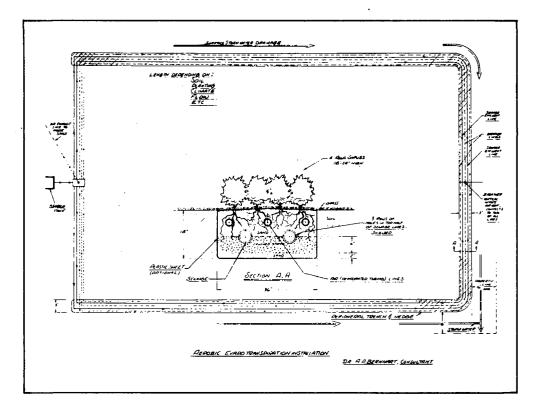
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Fig. 15. Hancor Bio-VenttM System (Bed design with optional perimeter drain shown.) Courtesy Hancor, Inc., Findlay, Ohio.

Fig. 14. Hancor Inverted Channel Air-flow

ground surface to enhance uptake of liquids and nutrients in the aerated root zone. The sumps are also extended to grade to permit easier access.

The Hancor Bio-Vent<sup>™</sup> Bed and Bio-Vent<sup>™</sup> Trench Systems, shown in Figures 15 and 16, were designed in collaboration with Bernhart, whose work is reported in Appendix A. The beds and trenches are innovative in that they include perforated air lines which run through the soil parallel to the effluent distribution laterals. The air lines are supplied by a vent pipe at the far end of the field. The near end of the air lines are connected to the plumbing ventilation stack at the house. The draft through the system can be improved by placing a wind turbine atop the house stack. These systems incorporate Bernhart's principles regarding improved performance of aerated soil absorption systems as compared to conventional systems.



Courtesy Hancor, Inc., Findlay, Ohio.

Fig. 16. Hancor Bio-vent<sup>TM</sup> System (Trench

design shown.)

Composite Systems Using Pressure Sewers Most conventional systems are designed to treat sewage on-site (septic tank and soil absorption field, for example) or at a central location (municipal sewer system feeding into a treatment plant). A *composite* system includes both on-site and centralized treatment facilities. One example is the incorporation of homes with septic tanks and homes

served by a conventional municipal sewer system into a sanitary district. Strictly speaking, this would be a combination of on-site and centralized systems, but this section is more concerned with systems which split the treatment for each home between on-site and centralized facilities.

#### **Basic Design Concepts**

The basic feature of a composite system that makes split treatment feasible is the use of small diameter pipe (approximately two inch) as pressure mains in place of conventional large diameter gravity flow sewer mains. For example, the Farmers Home Administration (FmHA) of the U.S. Department of Agriculture recently helped to finance projects in which two-inch polyvinyl chloride (PVC) pipe was bid in unclassified soil material with a cover of six feet for fifty-one cents per foot. Three-inch PVC was bid at seventy-one cents, and four-inch PVC was bid at ninety-seven cents. Conventional gravity sewers installed on grade cost about ten times as much. [19]

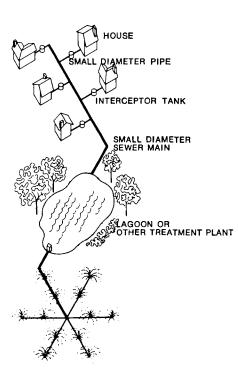
Before sewage can be expected to pass through such small pipe, solids must be reduced to very small sizes. Devices which break up solids in sewage are called comminutors. Combination grinder and pump units can be placed at each house for an installed price of \$1,200 to \$1,800. The grinder-pumps can force the comminuted sewage through the small pipes to a suitable central treatment facility. Several grinder-pump units are shown in Appendix C.

Aside from high initial cost, one drawback of grinder-pump units is that the homeowner is vulnerable to pump breakdowns. The entire system would also be vulnerable to an electrical power failure. If homes are close enough for several to empty sewage through the conventional household sewer pipe into a single tank serving the group in common, two grinder-pumps can economically be placed in the tank, thus offering some stand-by capability in the event of breakdown of one.

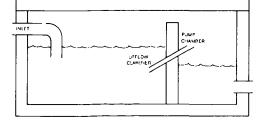
The ground-up sewage will contain greases which can cause clogging problems downstream unless the system is designed with utmost attention to hydraulics. Settled septic tank effluent is relatively free of both grease and solids and may be a better candidate for pumping. It may therefore be advantageous to install a modified septic tank which will settle solids from the sewage and remove the requirement for a grinder. In such an arrangement, a simple submersible sump pump can be used, at costs of about \$250 and up installed. Pumps are also illustrated in Appendix C.

#### **Design Parameters**

Rose has described a composite system using modified septic tanks and small diameter pressure mains. [19] He calls the modified tanks *interceptor tanks*. The system envisioned by Rose was based on an average wastewater production of 4,200 gallons per family per month, which is equivalent to an average of about 0.1 gallons/minute (gpm) or 140 gallons/day (gpd). Based on an assumed fifteen-minute peak demand factor of three







times average, ten families would account for as much as 3 gpm ( $10 \times 3 \times .1$  gpm). Thus, a 10-gpm pump would serve ten families with a comfortable safety factor. A 1000-gallon tank with 70 per cent effective storage space (30 per cent occupied by sludge and/or air voids) would be sufficient to hold four hours worth of flow for the ten families at the peak rate of 0.3 gpm per household. It would take a 2,000-gallon tank to provide twenty-four-hour average detention for the ten families at 140 gpd per family. In that case, two 1000-gallon tanks in series would be preferable to a single 2000-gallon tank, because more complete settling could be expected to result from two tanks in series.

The tanks would resemble septic tanks with an added sump compartment for pumping. The pipes connecting the first tank compartment to the second (pump sump) could be inclined upward in the flow direction (upflow) to provide additional solids separation capability. All tanks and pump equipment should be accessible from grade level for inspection, repair, and pumping of accumulated sludge at regular intervals.

The lines should be sized on the basis of creating a scouring velocity of at least 1 foot/ second (fps) with 3 fps preferable.\* Solids which may settle from the wastewater at low flow velocities should be resuspended and swept along (scoured) at the indicated velocities. The velocity of flow is found from the formula:

velocity (fps) =  $\frac{\text{flow rate (gpm)}}{2.45 \times [\text{diameter (inches)}]^2}$ 

Accordingly, a two-inch pipe would pass 10 gpm at about 1 fps, so that a pump of at least 10-gpm capacity should be used with two-inch pipe to achieve adequate scouring velocities. A two-inch pipe could handle, at a velocity of 3 fps, the flow for a community of one hundred families simultaneously producing sewage at the peak rate of 0.3 gpm each. Thus a two-inch pipe would also be adequate as a trunk sewer. Air relief valves may have to be installed at elevated points in the line to relieve a gas-bound condition. Gas may be formed from decomposing sewage. Gas is also introduced into the line when it is opened for inspection or for new tap-ins.

The hypothetical community of one hundred homes could also be served by vacuum sewer mains. In that case, the sump compartments of the tanks would be outfitted with heavy float valves to permit flushing in discrete doses and to permit the attaining of scouring velocities. Two 20-gpm horizontal centrifugal booster pumps capable of developing 10 pounds/square inch (psi) suction throughout the system should be capable of handling the chore. [19] The advantage of a vacuum collection system is that only one pumping source would be required for the entire community, and the single pump could be provided with standby power in the event of a power failure.

\*Cecil W. Rose, Farmers Home Administration, USDA So. Bldg., Washington, D.C. 20250. Personal communication, May, 1972. If the topography is favorable for elevating the tanks with respect to the sewers, the tanks could be fitted with float valves and dosing siphons. They would empty into the sewers under a gravity head alone, and with a modest fall along the sewer line it might be possible to design a system that would not even require mechanical pumps.

The scouring of long lines can be insured by placing a large (approximately 1000 gal.) flushing tank at the end of the line and permitting it to discharge once a day by means of a clock-controlled solenoid valve.

## Land Spreading General Concepts by Spray Irrigation

It has been estimated that by the mid-1960's more than 1,300 sewage treatment systems in the United States disposed of the effluent from their treatment plants by spreading it onto the land. Land spreading by flood, trickle, or spray irrigation is a feasible means of tertiary treatment. The process is illustrated schematically in Figure 17. Most of the considerations and precautions which apply to subsurface percolation of effluents also apply to surface spreading: the need to protect ground water quality, the clogging of soils under continuous inundation, contamination with microorganisms, and so forth. [20] Contamination with microorganisms is particularly important with spray irrigation since the aerosol created by the spray nozzles can contain and transport microorganisms. For this reason, some authorities require coliform counts ranging from swimming water quality (several hundred coliforms per 100 milliliters of water) to drinking water quality (generally less than 2 per 100 ml.). Irrigation of steeply sloping lands should also be executed with care to avoid soil erosion problems and possible concentration of effluent in converging runoff rivulets.

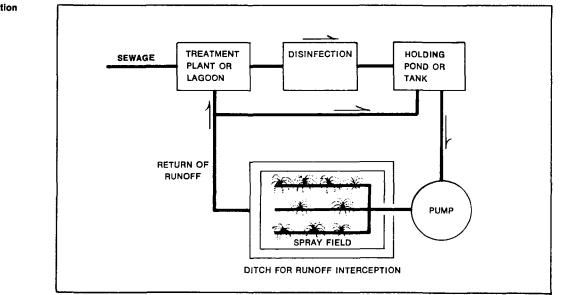


Fig. 17. Schematic diagram of spray irrigation of treated effluent.

Surface spreading of effluent may be used merely as a means of getting rid of liquid in a manner that will not pollute surface waters. Many systems, however, make positive use of the dissolved nutrients in wastewater for beneficial irrigation of crops. It has been calculated, for example, that 60 to 100 pounds of nitrogen, 60 to 100 pounds of phosphorus, and 20 to 40 pounds of potassium are available in each acre-foot of typical sewage effluent used for irrigation. [21] Yields of crops grown in soils thus irrigated are often more than 100 per cent greater than in non-irrigated plots. The increased yields continue for a few years after irrigation with effluent has been stopped.

Hortenstine concluded that:

"Spray irrigation of sewage wastewater on agricultural land is a feasible and efficient method of wastewater renovation. Removal of organic particles, nitrogen, phosphorus, and other constituents from the water is effected by the soil-plant system and this system can be maintained indefinitely under proper management." [21]

The land onto which wastewater is sprayed is much more than a gigantic mechanical filter. Heavily polluted water cannot be dumped onto porous soil and receive adequate treatment. The soil must be managed as a complex biological community, a "living filter." Maintenance of the living filter depends on a dense crop of living plants to remove nutrients in the wastewater. Soil must not become waterlogged, or it will become anaerobic and the soil organisms and plants which renovate the wastewater will die. Spraying operations should therefore be halted in wet weather when the ground is saturated. Likewise, toxic materials should not be applied, nor should materials toxic in large doses be allowed to accumulate in the soil.

According to Huckle, "One of the most important characteristics of a soil that affects its suitability for sprinkler irrigation is the water it can hold for plant consumption. This is available water capacity (AWC) of a soil, and is the range of soil water between the point where plants permanently wilt and field capacity. Field capacity is the amount of water held by the soil after free drainage has taken place. AWC is measured in inches of water per inch or foot of soil." [22] The frequency of applying irrigation water depends on the AWC in the plant root zone, the rate at which soil moisture is consumed and transpired by the plants, and the soil drainage.

Septic tank effluent should not be sprayed directly without additional treatment, nor should effluent from an anaerobic lagoon be sprayed, without first passing through an aerobic lagoon. This precaution is to minimize odors and prevent overloading of the soils' aeration capacity.

No spraying should be done on bare or disturbed soil. Even if the area is not cropped, ground cover is necessary to protect the soil from erosion, to shield the surface from droplet impact, to provide for evapotranspiration, and to increase infiltration rates. [23] A covered field will accept up to 85 per cent more water than an area with little or no vegetation. [24]

General criteria and rules of thumb for designing land spreading systems for partially treated sewage are described below. The criteria are included as flexible guides and should not be interpreted as rigid standards.

#### **Area Requirements**

**Size of Spray Field.** The amount of land required for spray irrigation may be approximated by the quotient of the amount of effluent generated (e.g., acre-inches per day) and the allowable application rate (e.g., inches per day). For instance, if a design value of 100 GPCD is used, 1000 people will call for 100,000 gpd which is equivalent to 3.68 acre-inches per day.\* If the allowable application rate (to maintain field capacity) is 0.25 inches per day, then 3.68/.25 = 14.72 acres of land will be required for the spray area (or for the flood area if flood irrigation is used). This combination of parameters is equivalent to a loading of 68 people/acre.

Actually, a loading of about 100 population equivalent per acre is a rather conservative rule of thumb, since in warm weather about 0.5 inches of effluent per day can be applied to good soils under cultivation, and 0.5 inches per day would correspond to about 150 population equivalent per acre. The more conservative criterion of 100 people per acre is to be preferred for a permanent system because the soil should, on the average, receive only about half its maximum infiltrative capacity. [25] This can be accomplished by uniform spreading at half-maximum rates of application, or, preferably, by alternating spraying between two or more fields with weekly (or longer) resting periods. [23] The resting cycles permit aerobic conditions to be reestablished in the soil which would otherwise become clogged and anaerobic under prolonged waterlogged conditions. The situation is much the same as in the practice of alternating soil absorption (tile, drainage) fields in a septic tank installation.

The above rules of thumb are very general and exclude the important effects of temperature. The ability of the soil to process effluent is related to temperature, as illustrated by the following guidelines suggested by Cochran: [25]

Dequired Correy Field Area

| Mean Temperature (°F) | Allowable Application Rate (inches/day) | Required Spray Field Area<br>(for 1,000 Population @ 100<br>GPCD and Alternating or<br>Half-maximum Usage,<br>in acres.) |
|-----------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 70                    | 0.64                                    | 11.4                                                                                                                     |
| 60                    | 0.50                                    | 15                                                                                                                       |
| 50                    | 0.36                                    | 20                                                                                                                       |
| 40                    | 0.20                                    | 36                                                                                                                       |
| 30                    | 0.07                                    | 104                                                                                                                      |
|                       |                                         |                                                                                                                          |

Accordingly, for mean temperatures of 50°F, about two acres per 100 population equivalent are required.

- \* 1 Acre-inch = 27,154 gallons
  - 1 Acre-foot = 325,848 gallons
  - 1 Million gallons per day = 695 gallons per minute = 36.8 Acre-inch per day = 3.07 Acre-feet per day
    - = 1105 Acre-feet per year

Many localities which experience freezing temperatures in winter require sufficient storage capacity to accommodate the total winter's effluent. The greater the storage, the more spray area that will be required for warm weather spraying. For example, if six months' worth of effluent is stored in the winter, then twelve months' worth of effluent will have to be applied in six warm months, effectively doubling the acreage requirements.\*

A loading of 100 population equivalent per acre corresponds to about 17 pounds of  $BOD_s$  per acre per day. This value is within the recommended  $BOD_s$  daily loading limit of 10 to 20 pounds per acre of surface area for lagoons in cold climates. The area required by a lagoon, if used, is in addition to the spray field area.

**Lagoon Area.** If a lagoon is used to stabilize the sewage prior to spraying, it is recommended that a maximum  $BOD_s$  loading of 15 to 20 pounds/acre/day be used in cold climates (ice cover more than one-third of the year) and up to 50 pounds/acre/day in winter and 150 pounds/acre/day in summer in warm climates. The greater loading rates depend on photosynthetic production of oxygen by algae which is only appreciable on warm sunny days. If recommended loading rates are exceeded, the ponds can go anaerobic and bad odors will be produced. Also, the wastes will receive less complete treatment. The low loading rates for cold climates will permit a rapid turnover of the pond from anaerobic to aerobic conditions when the ice cover thaws in early spring (surface reaeration by physical means alone in the absence of algal photosynthesis is in the 12 to 16 pound/acre/day range). [26]

Lagoons which depend upon natural processes for aeration should not be more than about five feet deep because sunlight can penetrate only several feet, and a very deep pond would become anaerobic below the zone of sunlight. However, ponds ten feet or more deep can be operated with mechanical aerators, which keep the water circulating and aerated. A minimum depth of three feet will help to control weed growth and mosquito breeding. [23] The surface area required for lagoons of various depths and holding periods is shown in Table 14.

The lagoon bottom should, in general, be sealed to prevent seepage of sewage into the soils where it could contaminate ground water. An exception is a pond underlain by soil of sufficient depth and quality to permit intentional use as a seepage pond which is designed to lose a large portion of its contents by seepage. Most ponds will, of course, also lose considerable amounts of water by evaporation.

**Total Area of Spray Installation.** The total size of the installation will be the sum of the lagoon (and/or holding pond) areas, plus the spray field, plus additional surrounding ditch and buffer zone areas. Interceptor ditches should be used on sloping land to

\*Six months' storage followed by six months' spraying has several advantages, however. Among them: lower operational costs for the spraying part of the system; added treatment over the longer detention time; nutrients tend to be bound up in algal and protozoan cells and thus are released more slowly after being applied to the soil.

catch surface runoff of effluent and prevent it from reaching areas outside the facility or surface waters. The intercepted runoff effluent should be returned to the lagoon or holding pond or tank. Diversion ditches should be provided to minimize the storm runoff which impacts on the lagoon and spray field.

Buffer zones of 400 to 800 feet are often recommended to protect neighbors from contamination by aerosols. [25] Protection is increased if trees or tall shrubs are planted around the spray area. The plant roots can also be used to advantage as a subsurface barrier to horizontal travel of effluent. If possible, the site should be more than onefourth of a mile from developed areas. [27, 28] The buffer requirements may be reduced if the effluent is disinfected prior to its being sprayed. However, unless the designer has a strong basis for confidence in the effectiveness and reliability of the disinfection process, this expedient is best not used. (Disinfection may be required in some locations.)

#### System Components and Layout

It is important that solids be removed from the effluent before spraying. This can be accomplished by sedimentation in lagoons as well as by screening through twenty- to forty-mesh screens. Screening or a settling tank should be used with wastes from agitated lagoons with high solids contents.

Larger nozzle diameters on sprinklers reduce clogging but increase droplet size. Small droplet size is desirable because it promotes evaporation before the spray even reaches the ground.

Pumps should be relatively immune to clogging. Centrifugal pumps are recommended, and if suction lift is required, the pumps should have a self-priming feature. [24]

Materials should be chosen carefully, as some chemicals in wastewater are corrosive to brass, aluminum and galvanized steel. The lines which feed the sprinklers can be buried below ground (solid set) or set above ground. Above ground lines have the

| Depth  |           | Holding T | ime (days) |      |  |
|--------|-----------|-----------|------------|------|--|
| (feet) | 7         | 30        | 180        | 360  |  |
| 4      | .54 acres | 2.3       | 13.8       | 27.6 |  |
| 6      | .36       | 1.5       | 9.1        | 18.4 |  |
| 8      | .27       | 1.1       | 6.9        | 13.8 |  |
| 10     | .21       | .9        | 5.5        | 11.0 |  |

### Table 14. Lagoon Surface Area for 1,000 Population Equivalent. (@ 100 GPCD) ()

Source: Robert A. Cochran, "Disposing of Human Sewage Effluent through Spray Fields and Living Soil Filters," private communication through Western Rain Bird Sales, Northwestern District, 626 Whitman, Walla Walla, Wash. 99362, Nov. 17, 1971.

advantage of portability, but they are subject to freezing in cold weather, and in warm weather their contents can decompose anaerobically (putrefy) if they are not drained after each use. Above ground lines are often made of aluminum, which can be subject to corrosion. Solid set lines are usually of polyvinylchloride (PVC), asbestos cement or steel construction. They can be set below the frost line with only risers and nozzles protruding. As with all systems subjected to inundation, contact of dissimilar metals should be avoided to prevent electrolytic decomposition.

Common sprinkler spacings are 80 ft. by 80 ft., 80 ft. by 100 ft., and 100 ft. by 100 feet. [24] Unlike strict agricultural applications where the design objective is to spread water on the soil evenly, the objective of spray irrigation of effluent is to dispose of as much water as possible into the soil without injuring the living filter or causing excessive runoff. Therefore, sprinkler coverage should not be overlapped in effluent spraying. [23] The spray field should be properly graded and underdrained where necessary. Both measures prevent ponding of effluent. Effluent from the drains should be returned to the lagoon if sufficient renovation has not occurred.

Cochran has prepared the following rules of thumb for sprinklers placed 80 ft. by 80 ft. (equivalent to seven sprinklers per acre): [25]

12.5 gpm per sprinkler = 0.18 inch per hour 16.0 gpm per sprinkler = 0.24 inch per hour 20.5 gpm per sprinkler = 0.30 inch per hour

The maximum recommended precipitation rates are:

Light sandy soil0.3 to 0.7 inch per hourMedium textured soil0.2 to 0.4 inch per hourHeavy textured soil0.1 to 0.2 inch per hour

Spraying should be on an intermittent schedule. This requires an arrangement for dosing or rotating among different sprinklers. Sepp recommends dosing at the rate of 10 minutes per hour in hillside installations. [23] The intermittent spraying not only minimizes surface runoff, but it takes advantage of the evaporation losses that are possible in air unsaturated with moisture. Cochran observed situations of rapid sequencing among sprinklers (6 minutes on—54 minutes off) where there was 100 per cent evaporation, i.e., absolutely no water intake into the soil, as compared to 12 per cent evaporation in a conventional system. On hot days of low humidity, rapid sequencing could be done for about 10 hours of daylight followed by long-set irrigation for the remaining 14 hours to supply moisture for plant growth. [25] This approach could significantly reduce the acreage requirements by disposing of more liquid through the evaporative route.

Whatever the spraying schedule, most authorities recommend that it be effected by welldesigned automatic controls rather than manually. This reduces the influence of the human element and requires less operation control. The savings in expert operator time

#### Alternate Approaches to Wastewater Systems Design

that are possible with automatic controls can be applied to a program of regular inspection of the spray equipment and fields by the operator, since nozzles can clog and jam, runoff rivulets can grow to undesirable size, and so forth.

In addition to the buffer zones and protective plantings discussed earlier, the entire installation should be fenced or otherwise secured to prevent public access.

## The Use of TreatedMany rural communities will want fire protection services built in along with water supplyWastewater as aMany rural communities will want fire protection services built in along with water supplyResource forFire ProtectionFire ProtectionTreated wastewater should not be overlooked by the community in formulating a fire protection plan.

For most small communities, peak fire-fighting demands will exceed domestic demands. This means that if the same water supply is used for both drinking and firefighting, the sizing of mains will be dominated by fire-flow considerations. Practically speaking, sixeight- or perhaps even ten-inch diameter mains will be required for delivering adequate fire-fighting flows, when two- or four-inch mains would have done the job for domestic water supply alone.

Domestic and fire-flow requirements are compared in Table 15, which was derived on the basis of the following criteria:

a) *Minimum design for domestic demand:* based on 3.5 people per household connection which decreases from 1.5 gpm at about 29 connections to 0.5 gpm per connection at about 290 connections and beyond.

b) Peak fire flow (in gallons per minute):  $1020\sqrt{P} (1.0 - 0.01\sqrt{P})$ , where P is the population *in thousands*. [29]

c) Duration of fire is 4 hours (1 and 2 story buildings generally adequately spaced to prevent spreading of fire).

d) Residual line pressure is a minimum of 20 pounds per square inch (psi) with the hydrant open. Pressure to be supplied either as city line pressure or by use of local elevated storage tanks.

Note that for populations under approximately 50,000, fire-flow requirements will always exceed domestic demand. Further, it is doubtful that criterion (c) would be satisfied at populations much beyond 10,000, i.e., houses would probably be close enough to permit the spread of fire at populations greater than 10,000.

It follows that at the low population levels which will be served by rural water supply systems, significantly more water storage capacity, as well as water transmission

#### 75

capacity, would have to be added over and above domestic supply needs to meet fire protection requirements. Even then, if the fire were to spread, the community could be seriously endangered. Wastewater treatment systems that collect effluent at a central point—either a community or a composite system—can and should form a part of a fire protection plan, if only as a reserve supply of fire-fighting water.

The total amount of water (in gallons) needed to meet the 4-hour criterion is 240 times the peak fire flow (in gallons per minute, gpm). Since the domestic demand criterion appears to have been based on a 100 GPCD water usage, it may be conservatively assumed that only 75 GPCD becomes treated wastewater which is held in reserve. If the total 4-hour fire flow (240 times peak) is divided by the daily production of treated wastewater (figured at 75 GPCD), the result is the number of days' accumulation of treated wastewater that would be required to meet the 4-hour supply criterion for *one* fire. Table 16 shows the total 4-hour flow and the number of days' accumulation of treated wastewater required to satisfy the criteria.

It can be seen from the table that a storage system such as a lagoon or deep aeration basin, or even a system of cisterns sized for a month's storage of wastewater will have sufficient water for fighting anywhere from three to thirty fires. Polishing lagoons or deep

| Population (thousands) | Peak Domestic Demand (gpm) | Peak Fire Flow (gpm) |  |  |
|------------------------|----------------------------|----------------------|--|--|
| 0.1                    | 43                         | 322                  |  |  |
| 0.2                    | 57                         | 454                  |  |  |
| 0.3                    | 70                         | 556                  |  |  |
| 0.4                    | 85                         | 641                  |  |  |
| 0.5                    | 100                        | 716                  |  |  |
| 0.6                    | 105                        | 783                  |  |  |
| 0.7                    | 110                        | 846                  |  |  |
| 0.8                    | 125                        | 904                  |  |  |
| 0.9                    | 135                        | 958                  |  |  |
| 1.0                    | 145                        | 1010                 |  |  |
| 2.0                    | 285                        | 1422                 |  |  |
| 3.0                    | 430                        | 1736                 |  |  |
| 4.0                    | 570                        | 1999                 |  |  |
| 5.0                    | 715                        | 2230                 |  |  |
| 10.0                   | 1430                       | 3124                 |  |  |
| 20.0                   | 2860                       | 4358                 |  |  |
| 50.0                   | 7145                       | 6702                 |  |  |

Table 15. Estimated Peak Domestic and Fire-fighting Demands on a Small Water Supply System.

tanks are often used for additional secondary treatment and also for storage in effluent irrigation-disposal systems for times when either excess rainfall or freezing temperatures do not permit irrigation.

The mere presence of adequate wastewater does not give any protection against fires. There must be a way of getting it to the fires. This can be accomplished by having separate fire and water supply mains. The fire mains could be supplied from both drinking water and treated wastewater sources in an emergency. Depending upon population distribution, holding cisterns for treated wastewater could be placed strategically throughout the community. They would be filled through small diameter pipes supplied by low capacity pumps at the wastewater treatment plant. The supply rate to the cisterns would be such that it could take days or even weeks to fill them, since their contents would be used infrequently. Storage cistern water would be pumped to the fire by pumper trucks operated by the fire company. Conveyance lines could be eliminated entirely if water trucks were available.

In any of these cases, the protection gained from using treated wastewater and the cost of supplying treated wastewater should be compared to the protection and costs associated with an all-drinking-water system. For example, if drinking water is available

| Population<br>(thousands) | Total Four-Hour Fire-Flow Need<br>(thousand gallons) | Number of Days'<br>Accumulation of<br>Treated Wastewater<br>(@ 75 GPCD) |
|---------------------------|------------------------------------------------------|-------------------------------------------------------------------------|
| 0.1                       | 77                                                   | 10.3                                                                    |
| 0.2                       | 109                                                  | 7.3                                                                     |
| 0.3                       | 133                                                  | 5.9                                                                     |
| 0.4                       | 154                                                  | 5.1                                                                     |
| 0.5                       | 172                                                  | 4.6                                                                     |
| 0.6                       | 188                                                  | 4.2                                                                     |
| 0.7                       | 203                                                  | 3.9                                                                     |
| 0.8                       | 217                                                  | 3.6                                                                     |
| 0.9                       | 230                                                  | 3.4                                                                     |
| 1.0                       | 242                                                  | 3.2                                                                     |
| 2.0                       | 341                                                  | 2.3                                                                     |
| 3.0                       | 417                                                  | 1.9                                                                     |
| 4.0                       | 480                                                  | 1.6                                                                     |
| 5.0                       | 535                                                  | 1.4                                                                     |
| 10.0                      | 750                                                  | 1.0                                                                     |

Table 16. Total Four-Hour Fire-Flow Needs and Number of Days' Accumulations of Treated Wastewater Required.

#### Alternate Approaches to Wastewater Systems Design

from plentiful high-quality surface supplies, then the cost of providing drinking water for fire protection will be accounted for mainly in the oversized mains and pumps, and the hydrants. On the other hand, if drinking water comes from a source of poor quality and limited capacity, then the added costs of excess drinking water treatment capacity and storage for contingencies could be significant.

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**Chapter Five** 

## **Operation of Rural Wastewater Systems**

In the operation of municipal sewer and sewage treatment systems, the costs of equipment and manpower for maintenance and monitoring are spread out over a large user community which pays for sewage collection and treatment services but does not participate in the provision of those services.

Maintenance in rural situations, on the other hand, depends to a large degree upon the cooperation and participation of individuals in the community served. In the traditional septic tank installation, for example, once the local health department licenses and approves the system, the householder is on his own. He is the owner and the operator of the septic tank and soil absorption system. If the system fails and his toilets back up, he is likely to correct the situation. On the other hand, if the system fails by allowing septic tank effluent to break through the surface of the ground or by permitting effluent to reach groundwaters before receiving sufficient treatment in the soil, the situation may not be recognized, and it is unlikely that it would be corrected if it were recognized unless a third party complained to the health authorities.

These problems are the result of traditional system practices in the U. S., but such problems need not be invariably associated with the use of individual wastewater systems. Individual wastewater systems in rural communities could be used effectively and economically if there were generally a better understanding of the principles upon which they should be designed and if management organizations were developed to assume responsibility for their operation and maintenance. Such management organizations are discussed more fully later in this chapter.

## Maintenance and Service

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#### Septic Tank Systems

Septic tanks should be inspected every year or so for sludge build-up. Depending on the size of the tank and rate at which it is loaded, the sludge should be pumped every two to three years to prevent sludge from being carried out of the tank and permitted to clog distribution lines, and to preserve sufficient volume in the tank to permit effective detention of the incoming wastewater. (Specific guidance on pump-out is given in Table 11.) Aside from this minimal maintenance and, possibly, the diverting of the effluent from one absorption field to another in installations employing alternate fields, there is little regular attention required.

#### **Aerobic Systems**

Individual aerated systems, on the other hand, are dependent on regular maintenance since they employ an electrically-powered aeration device. The air compressors require routine inspection, oiling, and replacement of vanes, seals or filters. If a compressor fails, the system will shift from an aerobic to an anaerobic (septic) state within a day or so. For this reason, many jurisdictions require that individual home aerobic units be of sufficient volume to act as acceptable septic tanks should the aerator fail.

In addition, it has been reported that sludge bulking, a decrease in density of the sludge to the point that it will not settle, sometimes occurs in individual aerobic systems, especially in response to highly variable loading patterns. Carryover of bulked sludge may cause adverse effects on a soil absorption system, but documentation is lacking.

The homeowner must have some means of determining that an aerobic system has broken down without his having to sample and check the effluent regularly as in a municipal plant. National Sanitation Foundation Standard 40\* requires a positive means of alarm to signal failure. Several parties have suggested the tying of an alarm signal to a relay that will turn off a key household electrical circuit such as the one that powers the television or even the water supply to the toilets in the event of failure. A few manufacturers dispose of treated wastewater in batches by means of a pump. (See Appendix C.) If the compressor fails, the pump circuit can be rendered inoperative. In that case, once the tank capacity had been reached, the plumbing fixtures in the house would not drain or flush. This approach provides an incentive to the homeowner to get the system fixed as well as a means for preventing the discharge of poorly treated sewage because effluent can't overflow through the pump.

Presently, service is at best an unevenly supplied and chance affair. The market for individual aerobic systems is generally too small to support an adequate service organization. Several of the more responsible manufacturers of aerobic systems have recognized that the small size and fragmented nature of the market prevents them as individual companies from offering adequate service. They are attempting to form an association which would try to organize service facilities to maintain products of a number of manufacturers. A pooling of service resources, at least in the short range, may help to improve the overall workability of individual aerobic systems and thus remove a key obstacle to their acceptance by many local authorities.

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#### Package Plants

Package plants face similar service problems. A facility which serves from tens to a few hundred homes is not normally sufficiently capitalized or supported to pay for full-time operational and maintenance personnel. If several subdivisions cooperate, they can share the costs of staff. Institutional factors can, of course, make cooperation a tenuous and difficult quality. For example, if all subdivisions are equal, who bears the administrative burden and responsibilities of the employer? If an administrative staff is to be established, how does it relate to the constituent subdivisions? How does it have to relate to the county or state?

At least one manufacturer of package plants builds service into the pricing and operation of their systems. Their service arrangements include routine testing of effluent quality and reporting of same to the owner. While this might reasonably be provided in a territory with many installations, it is difficult to see how such services could be provided economically for isolated plants.

The California State Department of Public Health, Bureau of Sanitary Engineering, conducted a survey of sewage disposal in communities in the Sierra Nevada Mountains and part of the San Bernardino Mountains which illustrates how efficiency is affected by the absence of servicing. [30] The area surveyed included all or part of twenty-three counties, and a good portion of the area was under the management of the National Forest Service or National Park Service.

At the completion of the study, the Bureau pointed out that "there is a great need for provisions for reliability of treatment and disposal operations in order to protect the public health."

It was also recognized that "small treatment plants often do not have full-time operators who are competent to handle breakdowns."

The data collected by the Bureau were startling; some of it follows:

"Experience has shown that interruption in sewage treatment is a relatively common occurrence. In 1964, the Bureau of Sanitary Engineering conducted a study of the public health aspects of sewage collection and disposal in the Central Valley. The results indicated that 56 per cent of the plants had experienced equipment outages during the preceding year. Chlorination equipment was reported out of service by 18 plants, with the outage varying from an hour to an entire year. Sedimentation units were out of service in 36 plants or 11 per cent of the plants. The sedimentation outages varied from an hour to 9 months. Trickling filters were reported inoperative by 20 plants and 17 digesters were reported out of service. The outages in these critical biological units ranged from an hour to 9 months. Thirty three per cent of the plants reported the necessity of bypassing untreated sewage for periods ranging from 6 hours to an incredible 300 days!"

In summary, the data collected presented the following unpleasant picture:

"55 per cent of community subsurface disposal systems had failed, 27 per cent of evaporation-percolation ponds (only) had failed, 33 per cent of ponds and hillside spray or irrigation systems had failed, 45 per cent of hillside spray (only) systems had failed, and 51 per cent of the systems with planned surface discharges had failed."

In design work, the consulting engineer should choose processes and equipment while bearing in mind that maintenance will most likely not be provided.

# ManagementThe development of collective public (perhaps municipal) institutions which would<br/>assume responsibility and/or authority for approving designs and installations and for<br/>providing routine inspection, maintenance, and corrective action in the event of failure<br/>is the most needed advance in small wastewater treatment system practices. Such public<br/>entities are reportedly commonplace in several European countries.

Although the concept is novel in this country, recently established public entities for California subdivisions utilizing septic tanks have been described by Winneberger and Anderman. [31] The "total management" concept developed through their efforts involves six "Criteria for Public Entities to Manage Septic-Tank Practices or Other Individual Sewage Disposal Systems." They state that the criteria are not concerned with the form of the public entity but rather the "kind of results needed to do the job." Their criteria are:

1. The legal entity should be responsible for the outcome of practices which have historically been relegated to the health department and the public.

2. The legal entity should provide services including:

a) design of each individual system,

b) inspection of installations, and

c) maintenance of individual systems.

3. The legal entity should maintain adequate records to provide proper guidance to the program.

4. The legal entity should provide professional skills needed to improve practices, such as

a) a full-time environmentalist to perform needed work, and

b) services of consultants for initial instruction and unusual workloads, special problems and occasional review. (During slow development, a consultant might serve until the workload justifies employment of a full-time sanitarian.)

#### **Operation of Rural Wastewater Systems**

83

5. The legal entity should have the authority and power to provide community collection systems whenever and wherever needed.

6. The legal entity should carry on a comprehensive watershed protection program (where appropriate) in conjunction with the local health entity, the state pollution control entities, and other pertinent public entities."

The Georgetown Divide Public Utility District, in cooperation with the El Dorado County Health Department,\* adopted an ordinance for the Auburn Lake Trails subdivision which attempts to do the total management job as outlined by Winneberger and Anderman. This is a noteworthy accomplishment, since Auburn Lake Trails contains almost 1,800 building lots which are designed for septic tank installations.

Another view of sewage disposal districts has been offered by Quigley and Beatty, [32] who made the following preliminary observations about Town Sanitary Districts (legal entities, in Wisconsin):

". . . control over improper waste disposal hinges on the constituents. If it is too expensive to correct problems, or if there is no direct nuisance created by malfunctioning systems, a Town Sanitation District may be no more effective than individuals. One Town Sanitation District [in their survey] did not report it because of high repair costs. The discharge went downstream. The county sanitarian discovered the problem after a few years [emphasis supplied] and put pressure on the district. If an individual homeowner does not repair a faulty disposal system it is that individual's decision until the problem is reported. In a Town Sanitary District one householder can refuse to repair a malfunctioning system only if all the members of that district decide not to comply. If one member wants the system to function he can require all of the disposal units to be repaired. Whether or not members would know if their district's system(s) were failing is not known. In areas where soil absorption systems do not function well and [sic] there is a greater incentive for members to tolerate malfunctioning systems. Town Sanitary Districts seem reluctant to allocate money for wages for the general clerical work necessary to operate the Town Sanitary District such as the posting of hearings or the soliciting of aid.

"... the District appears to be suited for cluster development since efficiency in TSD operation is directly related to population density. The TSD does not appear to be well suited to supervise treatment units in low density or scattered developments in the present form. Any economies of scale result from semi-concentrated development."

Taken together, the two views presented on collective public entities for managing rural wastewater facilities seem to suggest that:

(1) In areas where people live close enough together for one man's sewage to potentially endanger another's health, the establishment of some kind of collective public body

<sup>\*931</sup> Spring Street, Placerville, Calif., 95667.

to provide for a total management represents the only workable long-term solution to maintaining environmental health and sanitation, and

(2) the success of the public body in coping with failure and maintenance problems is quite strongly related to the members' perception of the impact of the problem on their well-being as balanced by the financial impacts of proposed actions.

An implication of the second observation is that certain performance standards for monitoring, reporting and corrective action should be imposed on any collective management entity. The standards would themselves be meaningless unless somebody checked to ascertain that they were being satisfied. This could be a county, state, or federal certification agency, or a private national agency with a meaningful and recognized accreditation program.

**Disposal of Septage** Septic tanks are normally emptied of excessive accumulations of sludge and scum by suction pumping through a hose into a tank truck sometimes referred to as a "honey wagon." Kolega\* and his associates have named the pumped contents of septic tanks *septage*. The disposal of septage can pose public health and environmental problems, since septage contains large concentrations of microorganisms and oxygen-demanding substances. Pump truck operators ("honey dippers") have been known to discharge septage into streams and rivers, drainage ditches, municipal sewers and on open land when they were not likely to be observed. Responsible practice in communities utilizing septic tanks requires adequate planning for the proper disposal of septage in order to avoid problems associated with unauthorized and unsupervised disposal.

Kolega and his colleagues have determined the properties of septage from 180 samples of material which were delivered to the Metropolitan District Commission water pollution control facility in East Hartford, Connecticut. One of the study's objectives was to derive criteria for designing septage treatment and disposal facilities on the basis of biological, physical, chemical and volumetric aspects of septage. Their findings are summarized in the information which follows.

#### Properties of Septage [33, 34]

The physical-chemical properties of septage vary considerably, as shown in Table 17.

The coefficients of variation (standard deviation of the sample expressed as a percentage of the sample mean) of the measured properties are generally well in excess of 50 per cent, which indicates that septage is highly variable in the measured properties. This is not unexpected since, in practice, pumping is apparently the universal "first cure" for a failing septic tank system, regardless of the reason for failure—accumulated sludge, high water table, or clogged absorption field. Thus, some pumpings will contain high concentrations of sludge, and others from systems that failed for reasons unrelated to

\*Department of Agricultural Engineering, The University of Connecticut, Storrs, Conn. 06268.

#### **Operation of Rural Wastewater Systems**

| Property of Septage                           | Median | Weighted<br>Mean | Standard<br>Deviation | Coefficient of<br>Variation, as<br>a Percentage |
|-----------------------------------------------|--------|------------------|-----------------------|-------------------------------------------------|
| BOD of Septage, mg/l                          | 2,912  | 3,840            | 4,410                 | 115                                             |
| BOD of Supernatant, mg/I                      | 1,528  | 1,860            | 1,240                 | 67                                              |
| COD* of Septage, mg/I                         | 16,803 | 25,600           | 26,900                | 105                                             |
| COD of Supernatant, mg/I                      | 5,280  | 6,690            | 7,280                 | 109                                             |
| Total Solids, percent                         | 1.45   | 2.37             | 2.69                  | 113                                             |
| Volatile Solids, percent<br>of total solids   | 70.5   | 67.5             | 15.4                  | 23                                              |
| Ash (fixed solids), percent of total solids   | 29.2   | 32.4             | 15.4                  | 48                                              |
| Total Suspended Solids,<br>mg/l               | 2,302  | 2,530            | 1,410                 | 56                                              |
| Volatile Suspended Solids<br>(ignition), mg/l | 1,343  | 1,880            | 1,390                 | 74                                              |
| Organic Nitrogen, mg/I                        | 12     | 32.7             | 45.7                  | 140                                             |
| Free Ammonia, mg/l                            | 62     | 71.7             | 41.7                  | 58                                              |

#### Table 17. Physical-Chemical Properties of Septage.

\*Chemical oxygen demand.

sludge accumulation will be dilute. Also, time lapses between pumping of septic tanks and emptying of the honey wagon could figure into the variability of the measured properties.

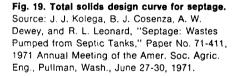
In view of the wide variability of the properties of septage, Kolega prepared cumulative distribution curves of the measured properties. Those for BOD and total solids are reproduced in Figures 18 and 19. They should be useful as design curves in planning septage disposal facilities.

The use of the design curves is illustrated in Figure 18, where the 50th percentile for BOD is at 2900 mg/l, and the 75th percentile is at 6350 mg/l, more than twice as great as the value at the 50th percentile. Conservative facility design based on the 75th percentile value could result in costs substantially greater than designs based on median values. The incremental costs of conservative design with respect to BOD might be justified on the basis that a temporary overload of BOD might disrupt operations. Inasmuch as an overload of solids would probably be less disruptive than a BOD overload, the designer might wish to be less conservative with respect to total solids. Similarly, the content of organic nitrogen in septage is a convenient design parameter

#### Fig. 18. BOD design curve for septage.

Source: J. J. Kolega, B. J. Cosenza, A. W. Dewey, and R. L. Leonard, "Septage: Wastes Pumped from Septic Tanks," Paper No. 71-411, 1971 Annual Meeting of the Amer. Soc. Agric. Eng., Pullman, Wash., June 27-30, 1971.

100 CUMULATIVE PERCENTAGE OF OBSERVATIONS 80 75% 60 MEDIAN =2912mg/l 50% MEAN =4794mg/l 40 20 0 10 14 2 8 12 16 6 A BOD SEPTAGE, 10<sup>3</sup> mg/l 100 -CUMULATIVE PERCENTAGE OF OBSERVATIONS 80 60 **MEDIAN=1.45% MEAN =2.24%** 40 20 0





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for land disposal by means such as plow-furrow-cover and sub-sod injection where excess nitrogen application could result in contamination of ground waters. [35]

#### **Volumes of Septage**

In a study based on mail surveys of households in unsewered areas to determine the incidence of pumping and on sampling of data from septic tank pumpers, it was estimated that, for Connecticut, the per capita production of septage in unsewered areas is between 65 and 70 gallons per year. [34] This figure is based on traditional practices, i.e., the absence of universal routine inspection and pumping, when indicated. A community of septic tanks maintained by a water and wastewater company should receive periodic inspection. Individual tanks should be pumped out when the scum and sludge buildup becomes excessive. The pumping frequency would probably increase under the recommended management practices, and the per capita production of septage (albeit, perhaps, a more dilute septage) would thus increase as well.

#### **Incremental Cost of Treating Septage**

The incremental cost of treating septage at a municipal sewage treatment plant was estimated to be 17.4 times as great as the incremental cost of treating an equivalent volume of sewage. [34] The estimate was based on the assumptions that 40 per cent of the incremental cost of treating normal sewage is attributable to handling the water content and that the remaining 60 per cent is about equally divided between primary and secondary treatment. The primary treatment costs were then inflated by the ratio of total solids in septage to total solids in sewage (40.5:1), and the secondary treatment costs were inflated by the corresponding BOD concentration ratio (16.2:1). While this estimate is offered as a basis for the rational setting of septage handling rates at sewage treatment plants employing primary and secondary treatment, it is realized that elements other than attributable cost enter into rate-setting procedures.

## **Costs of Wastewater Treatment Systems**

#### Introduction

Suggested retail costs for some of the major components of wastewater systems are presented in Appendix C. One of the big cost items not represented there is sewers. Two different estimates of sewer costs are included in this chapter in addition to estimates of costs based on community size.

In rural areas, household sewage generally receives treatment on-site in a system serving either one or a very few homes, or it is conveyed to a central community system which serves many households. As a rule, there are economies of scale which make a central plant less costly on a per-house basis (when the central system is used near its capacity) than an individual on-site unit. This holds true for initial capital costs as well as operating and maintenance (O&M) expenses. Furthermore, it may be easier for a skilled operator to maintain one plant in tip-top shape than to maintain many small plants, especially for sparsely populated areas where there are great distances between plant sites.

The equalizer, however, is the cost of piping sewage to the central plant. This principal holds true for a big municipal system as well as a package system for a small subdivision. The cost of piping sewage includes not only the cost of the pipe itself, but the cost of excavating and laying the pipe, as well as the cost of pumps (lift stations) which may be required in places where a gravity flow system cannot be designed. Gravity flow systems can be expensive in rural areas because of the great depths which are reached at the end of long runs of sewer, i.e., the fall of sewer required to keep the sewage moving accumulates with distance. In rough terrain, excavation costs will rise considerably.

Very often, therefore, central systems will not be economically feasible although they may be desirable for purposes of maintenance and control. Small diameter pressure sewers would, of course, increase the range of feasibility for community systems (see the section on composite systems.)

## Costs of CentralA comprehensive assessment of the costs of wastewater collection and treatment in theSystemsU.S. has been made by Smith and Eilers. [36] Their report contains best-fit estimating

#### **Cost of Wastewater Treatment Systems**

relationships (log-log regression equations) of the form  $Y = AX^B$ , where Y is the per capita cost (either initial capital cost or annual cost) for a community of population X (the design population). A and B are constants that make the estimating line fit best the points on a graph of per capita costs versus community size. Most of the costs in the Smith and Eilers report were expressed in 1968 dollars.

The estimating relationships of Smith and Eilers have been adjusted upward to 1973 dollars on the basis of an assumed 6.25 per cent annual inflation rate in the cost of constructing and operating sewage works, i.e., the costs have been inflated by  $(1.0625)^5$ , or 1.35. The adjusted costs are presented in Table 18 for community sizes of 100, 200, 500, and so forth, up to 10,000. Where two estimates, represented by *M* and *S*, are given for a cost (primary sedimentation plants, for example) they represent independent findings attributed to either Michel or Smith on which Smith and Eilers based their

Table 18. Estimated Per Capita Initial and Annual Costs of Waste Treatment System Components for Various Community Sizes. (1973 dollars)

|                               | $\mathbf{Y} = \mathbf{A}\mathbf{X}^{\mathbf{B}}$ |                    |                    |                  | Community Size   |                  |                  |                  |                |                |
|-------------------------------|--------------------------------------------------|--------------------|--------------------|------------------|------------------|------------------|------------------|------------------|----------------|----------------|
| ltem                          | Source                                           | A                  | В                  | 100              | 200              | 500              | 1,000            | 2,000            | 5,000          | 10,000         |
| Initial Costs                 |                                                  |                    |                    |                  |                  |                  |                  |                  |                |                |
| Waste Stabilization Ponds     | М                                                | 3,865.24           | 0.6050             | 238.33           | 156.69           | 90.01            | 59.18            | 38.91            | 22.35          | 14.70          |
| Primary Sedimentation Plants  | M<br>S                                           | 912.17<br>695.12   | —0.3274<br>—0.2890 | 201.96<br>183.68 | 160.96<br>150.33 | 119.24<br>115.36 | 95.03<br>94.42   | 75.74<br>77.28   | 56.11<br>59.30 | 44.72<br>48.54 |
| Activated Sludge Plants       | M<br>S                                           | 1,232.19<br>524.81 | 0.3088<br>0.2100   | 297.22<br>199.53 | 239.95<br>172.50 | 180.81<br>142.31 | 145.97<br>123.03 | 117.85<br>106.36 | 88.80<br>87.74 | 71.69<br>75.86 |
| Trickling Filter Plants       | M<br>S                                           | 1,275.78<br>428.73 | -0.3105<br>-0.2000 | 305.33<br>170.68 | 246.21<br>148.59 | 185.24<br>123.71 | 149.37<br>107.69 | 120.45<br>93.75  | 90.62<br>78.05 | 73.08<br>67.95 |
| Ancillary Works               | м                                                | 116.45             |                    | 77.08            | 72.44            | 66.73            | 62.71            | 58.93            | 54.29          | 51.02          |
| Sewers                        |                                                  | 2,745.71           | 0.2356             | 927.80           | 788.01           | 635.01           | 539.33           | 458.07           | 369.13         | 313.51         |
| Annual Costs                  |                                                  |                    |                    |                  |                  |                  |                  |                  |                |                |
| Waste Stabilization Pond O&M  | М                                                | 23.46              | -0.4172            | 3.44             | 2.57             | 1.76             | 1.31             | 0.98             | 0.67           | 0.50           |
| Primary Sedimentation O&M     | M<br>S                                           | 33.68<br>11.39     | —0.2600<br>—0.1750 | 10.17<br>5.09    | 8.49<br>4.51     | 6.69<br>3.84     | 5.59<br>3.40     | 4.67<br>3.01     | 3.68<br>2.57   | 3.07<br>2.27   |
| Activated Sludge O&M          | M<br>S                                           | 40.64<br>40.05     | -0.2460<br>-0.2400 | 13.09<br>13.26   | 11.04<br>11.23   | 8.81<br>9.01     | 7.43<br>7.63     | 6.26<br>6.46     | 5.00<br>5.19   | 4.22<br>4.39   |
| Trickling Filter O&M          | M<br>S                                           | 74.24<br>71.04     | —0.3569<br>—0.3400 | 14.35<br>14.84   | 11.20<br>11.73   | 8.08<br>8.59     | 6.31<br>6.78     | 4.93<br>5.36     | 3.55<br>3.92   | 2.77<br>3.10   |
| Sewer O&M                     |                                                  | 4.93               | -0.1976            | 1.98             | 1.73             | 1.44             | 1.26             | 1.10             | 0.92           | 0.80           |
| Customer Service & Accounting | М                                                | 101.55             | -0.4500            | 12.78            | 9.36             | 6.20             | 4.54             | 3.32             | 2.20           | 1.61           |
| General & Administrative      | М                                                | 309.29             | -0.5000            | 30.93            | 21.87            | 13.83            | 9.78             | 6.92             | 4.37           | 3.09           |

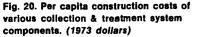
Source: R. Smith and R. G. Eilers, Cost to the Consumer for Collection and Treatment of Wastewater, U.S. Environmental Protection Agency, Advanced Waste Treatment Research Laboratory, Cincinnati, Ohio, July 1970.

#### Cost of Wastewater Treatment Systems

estimates. The independent values are preserved in Table 18 in part to indicate that a range of estimates exists. The values of A (adjusted to 1973 dollars) and B are also given in Table 18 to permit the calculation of costs for arbitrary community sizes.

The capital cost relationships are also illustrated graphically in Figures 20 through 23. O&M costs have not been presented as graphs because they are less likely to be reliable guides for future costs than are the capital cost relationships. (Less than adequate maintenance of small systems in the past means that the cost of proper maintenance is probably considerably greater than what is indicated by past experience.)

One of the most interesting conclusions that can be drawn from Table 18 and the associated graphs is that the costs of sewers dominate all other costs. Smith and Eilers partitioned their sample into classes of discrete community-size ranges and computed the average per capita cost and length of sewers for each class. Their results are shown in Table 19, in which costs have been again inflated to 1973 dollars. If average per capita cost is divided by average per capital length of sewer, the result is the average cost per foot of sewer. Note that the smallest community averages about four times as much sewer length per capital as the largest. Also, sewer construction costs for the smallest communities average almost 40 per cent higher than for the largest.



Source: R. Smith and R. G. Eilers, Cost to the Consumer for Collection and Treatment of Wastewater, U.S. Environmental Protection Agency, Advanced Waste Treatment Research Laboratory, Cincinnati, Ohio, July 1970.

### Fig. 21. Per capita cost of primary sedimentation plants. (1973 dollars)

Source: R. Smith and R. G. Eilers, Cost to the Consumer for Collection and Treatment of Wastewater, U.S. Environmental Protection Agency, Advanced Waste Treatment Research Laboratory, Cincinnati, Ohio, July 1970.

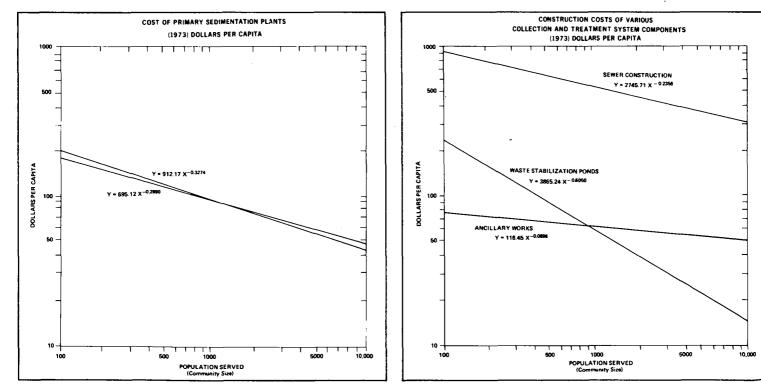


 Table 19. Construction Costs and Lengths of Sewers for Various Community Sizes.

 (1973 dollars)

| Community<br>Size | Numb <del>er</del> of<br>Systems<br>in Class | Avg. Service<br>Population<br>per System | Avg. Sewer<br>Cost per<br>Capita<br>(dollars) | Avg. Sewer<br>Length per<br>Capita (feet) | Avg. Sewer<br>Cost per foot<br>(dollars/foot) |
|-------------------|----------------------------------------------|------------------------------------------|-----------------------------------------------|-------------------------------------------|-----------------------------------------------|
| Less than 500     | 1,791                                        | 387                                      | 676.38                                        | 36.93                                     | 18.32                                         |
| 500- 1,000        | 2,259                                        | 809                                      | 568.57                                        | 32.10                                     | 17.71                                         |
| 1,000- 5,000      | 5,375                                        | 2,304                                    | 444.37                                        | 26.32                                     | 16.89                                         |
| 5,000- 10,000     | 1,516                                        | 6,312                                    | 350.45                                        | 21.73                                     | 16.13                                         |
| 10,000- 25,000    | 1,200                                        | 12,920                                   | 296.03                                        | 18.96                                     | 15.61                                         |
| 25,000 50,000     | 422                                          | 30,089                                   | 242.57                                        | 16.15                                     | 15.02                                         |
| 50,000–100,000    | 203                                          | 66,114                                   | 201.50                                        | 13.91                                     | 14.48                                         |
| 100,000 and over  | 145                                          | 511,212                                  | 124.45                                        | 9.43                                      | 13.20                                         |

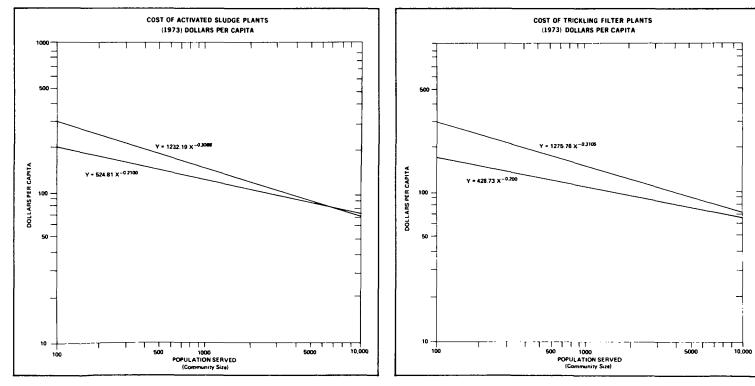
## Fig. 22. Per capita cost of activated sludge plants. (1973 dollars)

Source: R. Smith and R. G. Eilers, Cost to the Consumer for Collection and Treatment of Wastewater, U.S. Environmental Protection Agency, Advanced Waste Treatment Research Laboratory, Cincinnati, Ohio, July 1970.

## Fig. 23. Per capita cost of trickling filter plants. (1973 dollars)

Source: R. Smith and R. G. Eilers, Cost to the Consumer for Collection and Treatment of Wastewater, U.S. Environmental Protection Agency, Advanced Waste Treatment Research Laboratory, Cincinnati, Ohio, July 1970.

Source: R. Smith and R. G. Eilers, Cost to the Consumer for Collection and Treatment of Wastewater, U.S. Environmental Protection Agency, Advanced Waste Treatment Research Laboratory, Cincinnati, Ohio, July 1970.



#### Cost of Wastewater Treatment Systems

#### An Estimate of Sewer Construction Costs in Rural Areas

The Smith and Eilers' data for sewers includes all costs of sewer construction. A breakout of average preliminary sewer construction cost estimates appropriate to rural areas are shown in Tables 20 and 21.

As an example, consider an 8-inch Average Sanitary Sewer (@ \$10.00/ft.) in a region of high water table that requires dewatering during construction (@ \$2.00/ft.) and replacement of a gravel roadway (@ \$2.00/ft.) in addition to manholes (@\$1.00/ft.) and house wyes (tapoffs, @ \$0.50/ft.). The total is \$15.50 per foot of branch sewer, to which the cost of sanitary service from the road to the property line must be added (@ \$6 to 8 per foot of sanitary service). For an average property line setback of 20 feet, sanitary service would add about \$0.25 to the cost of each foot of branch sewer. The total cost is about \$16 per foot of branch sewer, about the same as the average sewer cost for communities between 5,000 and 10,000 population (Table 19).

## Table 20.Preliminary SewerConstruction Cost Estimates.

| Cost<br>(dollars/foot) |
|------------------------|
| \$8-10                 |
| 11-12                  |
| 9-11                   |
| 12                     |
| 14                     |
| 17                     |
| 20                     |
|                        |

Both tables courtesy Z. R. Miller, William & Works, Engineers, 250 Michigan St., N.E., Grand Rapids, Michigan 49503, private communication, Nov. 14, 1972.

## Table 21. Preliminary Additive CostEstimates for Sewer Construction.

| Items                                                 | Cost<br>(dollars/foot) |
|-------------------------------------------------------|------------------------|
| Constant                                              |                        |
| Manhole (assumes 1 every 400                          |                        |
| feet)                                                 | \$1                    |
| House Connection Wyes (as-<br>sumes 1 every 600 feet) | .50                    |
| 6" Sanitary Service (house                            |                        |
| sewer)                                                | 6-8                    |
| Variable                                              |                        |
| Concentrated Area                                     | 2                      |
| Dewatering                                            | 2                      |
| Bituminous Roadway* Replace-                          |                        |
| ment                                                  | 4                      |
| Concrete Roadway* Replace-                            |                        |
| ment                                                  | 10                     |
| Sidewalk Replacement                                  | 4                      |
| Gravel Roadway* Replacement                           | 2                      |
| Miscolianoous                                         | Cost (dollars          |

| Miscellaneous        | Cost (dollars) |
|----------------------|----------------|
| Average Lift Station | \$20,000/each  |
| 4" Force Main        | 5/foot         |
| 6" Force Main        | 7/foot         |
| Rock Excavation      | 10-40/cu.yd.   |
| Bore and Jackt       | 80/foot        |

\*20-ft. wide

†Enclosed tunnel bored under railroad track, etc.

# Cost of Wastewater Treatment Systems

The above figures are typical average figures. They are appropriate to preliminary design estimates only. Actual costs will vary considerably with topography, geology, population density and local code requirements.

Costs of PackageThe purchase costs of 2,000 to 50,000-gpd package plants illustrated in Appendix CPlants(the equipment catalogue) lie between:

\$3,000 plus \$0.35 per gallon rated daily capacity, and \$3,000 plus \$1.35 per gallon rated daily capacity.

Normally, sludge digesters, disinfection devices, grating covers, comminutors, larger pumps, and several other items are optional at extra cost. Installation costs are extra, and they can amount to 20 to 50 per cent of the basic purchase price.

Costs of On-Site Systems Aerobic tanks vary in list price from \$600 to over \$2,000 (see Apendix C for more information). On the average, about \$1,200 per unit can be used for preliminary design estimates. Septic tanks can be purchased for about \$100 to \$200. The soil absorption fields will vary greatly in price with labor rates, soil conditions and code requirements. Anywhere from \$200 to \$800 should be budgeted for soil absorption systems which serve aerobic tanks, and anywhere from \$200 to \$1,200 for soil systems which serve septic tanks.

Operating costs for aerobic tanks will be about \$2 to 3 per month for electricity, another dollar for chlorine where used, and some \$50 to \$100 per year for a service contract. Septic tanks will require pumping about once every two to three years (less frequently for intentionally oversized septic tanks) at a cost of about \$25 to \$75 (much more if the access covers are underground and the homeowner doesn't know where the tank is located).

**Cost Comparisons**— **Annualization** Insofar as systems may be compared on the basis of cost alone, one useful and valid approach to cost comparisons involves annualization. This approach can be illustrated as follows: consider a system that costs \$200,000 and has a design lifetime of twenty years. This may seem like \$10,000 per year (\$200,000 ÷ 20), but because the \$200,000 would most likely have to be borrowed, interest also has to be paid on the loan. At 8 per cent interest for twenty years, a total of \$407,400 would have been paid back at the rate of \$20,370 per year—more than twice the "cost" (initial principal) of the system.

The multiplier which is used to convert initial principal to annual payment at interest is called an *annualization factor*. Annualization factors for system lifetimes ranging from one to fifty years for interest rates between 4 and 11.5 per cent (in .5 per cent incre-

ments) are tabulated in Table 22. The table is a handy reference since all but the most recent handbooks containing annuity tables usually do not include interest rates above 6 per cent. While municipal bonds and government loans at such low interest rates are available, loans from private sources will probably bear interest rates closer to 8 per cent.

Annualized costs are convenient for comparing alternative system configurations. For example, in areas having low population density the use of many small treatment plants instead of one or a few large centralized plants may be justified on the basis that they cost less than the total cost of the large plants and the sewer lines that would be required to reach the central plant(s). It would be a mistake merely to compare initial capital costs, since lifetimes of the various components are likely to be different and because the recurring costs, which could also be expected to differ, should be considered. It is likely that a part of the savings of capital for sewers that would be realized in multiple small-unit systems might be offset by increased recurring maintenance costs for the small systems.

A summary of costs which should be included in the calculations for all systems considered is as follows:

1

---Annualized first costs, including basic equipment all accessories, connecting lines, etc. all installation costs, including utility connections design costs, inspection costs, etc.

-Replacement costs

-Recurring costs (on a comparable annual basis), including utility charges chemicals and other operating supplies maintenance and service.

As an example of annualized cost determination, consider a hypothetical home aerobic plant which costs \$1200 plus \$100 to install. It has a design lifetime of thirty years, except for the compressor which has a ten-year lifetime and a replacement cost of \$150. The soil absorption system costs \$400 (installed) and has a design lifetime of fifteen years. Operating costs are estimated at \$25 per year for electricity and \$50 per year for a service policy.

Table 22. Annualization Factor.

| Yrs.                       | 4%                            | 4.5%                          | 5%                            | 5.5%                          | 6%                            | 6.5%                          | 7%                            | 7.5%                          | 8%                                                  | 8.5%                          | 9%                            | 9.5%                          | 10%                           | 10.5%                         | 11%                           | 11.5%                         |
|----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| 1<br>2<br>3<br>4<br>5      | 0.53020<br>0.36035<br>0.27549 | 0.53401<br>0.36378<br>0.27875 | 0.53781<br>0.36722<br>0.28202 | 0.54163<br>0.37066<br>0.28530 | 0.54544<br>0.37411<br>0.28860 | 0.54926<br>0.37758<br>0.29190 | 0.55310<br>0.38105<br>0.29523 | 0.55693<br>0.38454<br>0.29857 | 1.08000<br>0.56077<br>0.38803<br>0.30192<br>0.25046 | 0.56462<br>0.39154<br>0.30529 | 0.56847<br>0.39506<br>0.30867 | 0.57233<br>0.39858<br>0.31206 | 0.57619<br>0.40212<br>0.31547 | 0.58006<br>0.40566<br>0.31889 | 0.58394<br>0.40921<br>0.32233 | 0.58781<br>0.41278<br>0.32577 |
| 6<br>7<br>8<br>9<br>10     | 0.16661<br>0.14853<br>0.13449 | 0.16971<br>0.15161<br>0.13758 | 0.17282<br>0.15472<br>0.14069 | 0.17597<br>0.15787<br>0.14384 | 0.17914<br>0.16104<br>0.14702 | 0.18233<br>0.16424<br>0.15024 | 0.18555<br>0.16747<br>0.15349 | 0.18880<br>0.17073<br>0.15677 | 0.21632<br>0.19207<br>0.17402<br>0.16008<br>0.14903 | 0.19537<br>0.17733<br>0.16343 | 0.19859<br>0.18068<br>0.16680 | 0.20204<br>0.18405<br>0.17021 | 0.20541<br>0.18744<br>0.17364 | 0.20880<br>0.19087<br>0.17711 | 0.21222<br>0.19432<br>0.18060 | 0.21566<br>0.19780<br>0.18413 |
| 11<br>12<br>13<br>14<br>15 | 0.10655<br>0.10014<br>0.09467 | 0.10967<br>0.10328<br>0.09782 | 0.11283<br>0.10646<br>0.10103 | 0.11603<br>0.10969<br>0.10428 | 0.11928<br>0.11296<br>0.10759 | 0.12257<br>0.11628<br>0.11094 | 0.12590<br>0.11965<br>0.11435 | 0.12928<br>0.12306<br>0.11780 | 0.14008<br>0.13270<br>0.12652<br>0.12130<br>0.11683 | 0.13615<br>0.13002<br>0.12484 | 0.13965<br>0.13357<br>0.12843 | 0.14319<br>0.13715<br>0.13207 | 0.14576<br>0.14078<br>0.13575 | 0.15033<br>0.14445<br>0.13947 | 0.15403<br>0.14815<br>0.14323 | 0.15771<br>0.15190<br>0.14703 |
| 16<br>17<br>18<br>19<br>20 | 0.08220<br>0.07899<br>0.07614 | 0.08542<br>0.08224<br>0.07941 | 0.08870<br>0.08555<br>0.08275 | 0.09204<br>0.08892<br>0.08615 | 0.09545<br>0.09236<br>0.08962 | 0.09891<br>0.09585<br>0.09316 | 0.10243<br>0.09941<br>0.09675 | 0.10600<br>0.10303<br>0.10041 | 0.11298<br>0.10963<br>0.10670<br>0.10413<br>0.10185 | 0.11331<br>0.11043<br>0.10790 | 0.11705<br>0.11421<br>0.11173 | 0.12083<br>0.11805<br>0.11561 | 0.12466<br>0.12193<br>0.11955 | 0.12855<br>0.12586<br>0.12353 | 0.13247<br>0.12984<br>0.12756 | 0.13644<br>0.13387<br>0.13164 |
| 21<br>22<br>23<br>24<br>25 | 0.06920<br>0.06731<br>0.06559 | 0.07255<br>0.07068<br>0.06899 | 0.07597<br>0.07414<br>0.07247 | 0.07947<br>0.07767<br>0.07604 | 0.08305<br>0.08128<br>0.07968 | 0.08669<br>0.08496<br>0.08340 | 0.09041<br>0.08871<br>0.08719 | 0.09419<br>0.09254<br>0.09105 | 0.09983<br>0.09803<br>0.09642<br>0.09498<br>0.09368 | 0.10194<br>0.10037<br>0.09897 | 0.10591<br>0.10438<br>0.10302 | 0.10993<br>0.10845<br>0.10713 | 0.11401<br>0.11257<br>0.11130 | 0.11813<br>0.11675<br>0.11552 | 0.12231<br>0.12097<br>0.11979 | 0.12654<br>0.12524<br>0.12410 |
| 26<br>27<br>28<br>29<br>30 | 0.06124<br>0.06001<br>0.05888 | 0.06472<br>0.06352<br>0.06242 | 0.06829<br>0.06712<br>0.06605 | 0.07195<br>0.07082<br>0.06977 | 0.07570<br>0.07459<br>0.07358 | 0.07952<br>0.07845<br>0.07747 | 0.08343<br>0.08239<br>0.08145 | 0.08740<br>0.08641<br>0.08550 | 0.09251<br>0.09145<br>0.09049<br>0.08962<br>0.08883 | 0.09556<br>0.09464<br>0.09381 | 0.09974<br>0.09885<br>0.09806 | 0.10397<br>0.10312<br>0.10236 | 0.10826<br>0.10745<br>0.10673 | 0.11260<br>0.11183<br>0.11114 | 0.11699<br>0.11676<br>0.11561 | 0.12143<br>0.12073<br>0.12011 |
| 31<br>32<br>33<br>34<br>35 | 0.05595<br>0.05510<br>0.05432 | 0.05956<br>0.05875<br>0.05798 | 0.06328<br>0.06249<br>0.06176 | 0.06710<br>0.06634<br>0.06563 | 0.07100<br>0.07027<br>0.06960 | 0.07500<br>0.07430<br>0.07366 | 0.07907<br>0.07841<br>0.07780 | 0.08323<br>0.08259<br>0.08201 | 0.08811<br>0.08745<br>0.08685<br>0.08630<br>0.08580 | 0.09174<br>0.09118<br>0.09066 | 0.09510<br>0.09556<br>0.09508 | 0.10051<br>0.10000<br>0.09955 | 0.10497<br>0.10450<br>0.10407 | 0.10948<br>0.10904<br>0.10864 | 0.11404<br>0.11363<br>0.11326 | 0.11864<br>0.11826<br>0.11791 |
| 36<br>37<br>38<br>39<br>40 | 0.05224<br>0.05163<br>0.05106 | 0.05598<br>0.05540<br>0.05486 | 0.05984<br>0.05928<br>0.05877 | 0.06380<br>0.06327<br>0.06278 | 0.06786<br>0.06736<br>0.06689 | 0.07201<br>0.07153<br>0.07110 | 0.07624<br>0.07580<br>0.07539 | 0.08055<br>0.08013<br>0.07975 | 0.08534<br>0.08492<br>0.08454<br>0.08419<br>0.08386 | 0.08937<br>0.08901<br>0.08868 | 0.09387<br>0.09354<br>0.09324 | 0.09843<br>0.09812<br>0.09784 | 0.10303<br>0.10275<br>0.10249 | 0.10768<br>0.10742<br>0.10718 | 0.11236<br>0.11213<br>0.11191 | 0.11709<br>0.11687<br>0.11667 |
| 41<br>42<br>43<br>44<br>45 | 0.04954<br>0.04909<br>0.04866 | 0.05341<br>0.05298<br>0.05258 | 0.05740<br>0.05699<br>0.05662 | 0.06149<br>0.06111<br>0.06076 | 0.06568<br>0.06533<br>0.06501 | 0.06997<br>0.06964<br>0.06934 | 0.07434<br>0.07404<br>0.07376 | 0.07878<br>0.07850<br>0.07825 | 0.08356<br>0.08329<br>0.08303<br>0.08280<br>0.08259 | 0.08786<br>0.08763<br>0.08741 | 0.09248<br>0.09227<br>0.09208 | 0.09715<br>0.09696<br>0.09678 | 0.10186<br>0.10169<br>0.10153 | 0.10661<br>0.10645<br>0.10631 | 0.11139<br>0.11125<br>0.11113 | 0.11620<br>0.11608            |
| 46<br>47                   |                               |                               |                               |                               |                               |                               |                               |                               |                                                     |                               |                               |                               |                               |                               |                               | 0.11577<br>0.11569            |
| 48<br>49<br>50             | 0.04686                       | 0.05089                       | 0.05504                       | 0.05930                       | 0.06366                       | 0.06811                       | 0.07264                       | 0.07723                       |                                                     | 0.08659                       | 0.09134                       | 0.09613                       | 0.10095                       | 0.10579                       | 0.11067                       | 0.11562<br>0.11556<br>0.11550 |

First, the initial plant cost of \$1200 may be separated into \$1050 for the thirty-year basic plant plus \$150 for a ten-year compressor. The \$1050 is annualized over the full thirty-year period, but the compressors are annualized over their ten-year lifetime only.

Assume an interest rate of 8 per cent. The computations are as follows:

| Basic system<br>Installation<br>Total                                           | \$1050<br>100<br>\$1150 × .08883* (for 30 years, 8%) = \$102.15 |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Compressor                                                                      | \$ 150 × .14903* (for 10 years, 8%) = 22.35                     |
| Soil absorption system                                                          | \$ 400 × .11683* (for 15 years, 8%) = 46.73                     |
| Annualized capital costs<br>Service policy (annual)<br>Operation costs (annual) | \$171.23<br>50.00<br>25.00                                      |
| Total annual cost<br>or about \$20.50 per                                       | \$246.23<br>month†                                              |
| At 4% interest, the costs are:                                                  |                                                                 |
| Basic system                                                                    | $1150 \times .05783^*$ (for 30 years, 4%) = \$ 66.50            |
| Compressor                                                                      | $150 \times .12329^*$ (for 10 years, 4%) = 18.49                |
| Soil absorption system                                                          | \$ $400 \times .08994^*$ (for 15 years, 4%) = 35.98             |
| Annualized capital costs<br>Service policy (annual)<br>Operation costs (annual) | \$120.97<br>50.00<br>25.00                                      |
| Total annual cost<br>or about \$16.30 p                                         | \$195.97<br>ber month†                                          |

\*Annualization factor.

†Actually, if the loan were to be paid in monthly installments, the monthly costs quoted above would have to be adjusted slightly. Note that each component of the system was annualized at the figure corresponding to its lifetime, and that annually recurring costs (e.g., operation and maintenance) are added after all fixed costs are annualized. In actuality, a homeowner would probably not choose to finance a system in precisely the manner described above. Annualization is a convenient fiction which puts costs on a constant yearly basis for the sake of comparison with other systems which are similarly costed. Incidentally, the example illustrates how a loan subsidy of half the 8 per cent interest rate could lower the monthly cost to the household by about \$4.00.

Appendices

# Introduction to Appendix A

This Appendix contains a method proposed in April, 1972, by Alfred P. Bernhart, D.Sc., Associate Professor of Civil Engineering, University of Toronto, Toronto, Ontario, Canada, for determining sizes of building lots in areas where sewage is to be disposed on site. The method presumes that either a single septic tank or aerobic tank will be used and that disposal will be accomplished in a subsurface soil disposal system which operates predominantly either by aerobic or by anaerobic processes. The soil absorption system can operate in the aerobic mode if the oxygen supply is enhanced with venting arrangements called breezers or breathers (see Chapter Four). Whether aerobic or anaerobic, the soil absorption system will depend heavily on infiltration and evapotranspiration for disposal of effluent.

The method consists of breaking the lot into functional areas which include areas for subsurface disposal and drainage as well as for structures, recreation and a special provision for safe separation between the sewage-containing soil and a well used for drinking water.

Bernhart's early work was described in his now out-of-print book, "Treatment and Disposal of Waste Water From Homes" (Toronto, 1967). The material included here on lot sizing is an extension of that work. Some of the details, especially the propositions governing the safe protective distance between the seepage bed and well, are based on safe figures taken from literature data. Experiments to verify and possibly to reduce the proposed safe protective distances are presently being conducted at Bernhart's University of Toronto laboratories.

Bernhart's volumetric calculations are based on the Imperial gallon, which is equivalent to about 1.2 U. S. gallons. He assumed a design value of sewage production of 160 gal (Imp.) per household per day, or 192 gal (U.S.) per household per day, a figure which was statistically researched and verified for southern Ontario households. That amounts to about 55 gal (U.S.) per capita per day (GPCD). Most U. S. design criteria generally call for 75 to 100 GPCD. As clean water becomes a scarcer and more costly commodity, it can be anticipated that water-saving techniques such as flow control and

# Introduction to Appendix A

recycling of gray water for toilet flushing will reduce consumption rates significantly. For now, however, considering regulations on expected sewage flows in some U.S. states, Bernhart's calculations should be modified by changing the daily flows from a household ("F") from 160 gal (Imp.)/day, or about 200 gal (U.S.)/day, to 300 or 400 gal (U.S.)/day per household.

By comparison, Bernhart's use of evapotranspiration and infiltration rates [gal (Imp.) per square foot per day] need not be modified because the inaccuracies inherent in their measurement generally exceed the 20 per cent difference between Imperial and U. S. gallons by a considerable degree.

# Contents

# Method to Determine Property Sizes, 100 The Five Step Method, 100

Step 1: The Seepage Bed Area, 100

Step 2: The Green Area, 106

- Step 3: The Drainage Area, 108
- Step 4: The Building Area, 110

Step 5: The Well Protection Area, 111

# Summary, 115

Conclusion, 119

References, 119

#### **Figures**

- 1 Diagrammatic sketch of property lot, 101
- 2a Recommended design for aerated tanks, 103
- **2b** Recommended design for septic tanks, 103
- Aerobic seepage bed or trench, anaerobic seepage bed or trench, 104
- 4 Combined seepage rates, 105
- **5** Seepage bed area, *106*
- 6 Green area "safety frame," 108
- 7 Design of green area, 108
- 8 Drainage areas, 108
- 9 Drainage areas, 109
- 10 Grade factor for drainage area, 109
- 11 Drainage area, 110
- **12** Horizontal protective distance, *112*
- 13 Horizontal protective distance, 113
- 14 Influence of well depth on lot size, 114
- 15 Summary of lot areas, 116
- 16 Comparison of lot sizes, 117
- 17 Comparison of lot sizes, 117
- **18** Sequence of design steps, *118*
- 19 Lot layout, 119

#### Tables

- **1** Soil Infiltration Rates, 104
- 2 Evapotranspiration Rates, 104
- 3 Area of Seepage Bed, 106
- 4 Green Area, 107
- 5 Drainage Area, 110
- 6 Building Area, 111
- 7 Building Areas, 111
- 8 Horizontal Protective Distances, 113
- 9 "Built-In" Horizontal Protective Distances, 113
- **10** Minimum Depth of Well without Protection Area, *114*
- 11 Summary of Lot Areas, 116

# A Rational Approach to Determining Sizes of Building Lots According to Their **Capabilities for On-Site Wastewater Treatment and Disposal**

By Alfred P. Bernhart, D.Sc.

April 1972

#### Method to Determine A Five-Step Calculation and Design Procedure for suburban, rural or recreational lots in areas where the wastewater is disposed by soil infiltration and evapotranspiration and where water is supplied by individual wells.

For the purpose of the property size determination, the lot is composed of four component parts (Figure 1):

1. The **building area**, B, which contains the house, garage, driveway, patio, swimming pool and ornamental areas in front of the house.

2. The green area, G, which has as its main function the disposal of wastewater. It should be beautifully landscaped with grass and shrubbery and is not suitable for active sports.

3. The drainage area, D, which serves to funnel the storm water effluent away from the propertv.

4. The well protection area, P, which insures that a "protective distance" exists between the mouth of the water supply well and the soil infiltration bed of the neighbouring lot.

All component areas can be determined by blanket calculations carried out for all subdivision lots or each component area can be individually designed for each lot. The latter method generally leads to slightly smaller property sizes.

#### The Five-Step Method

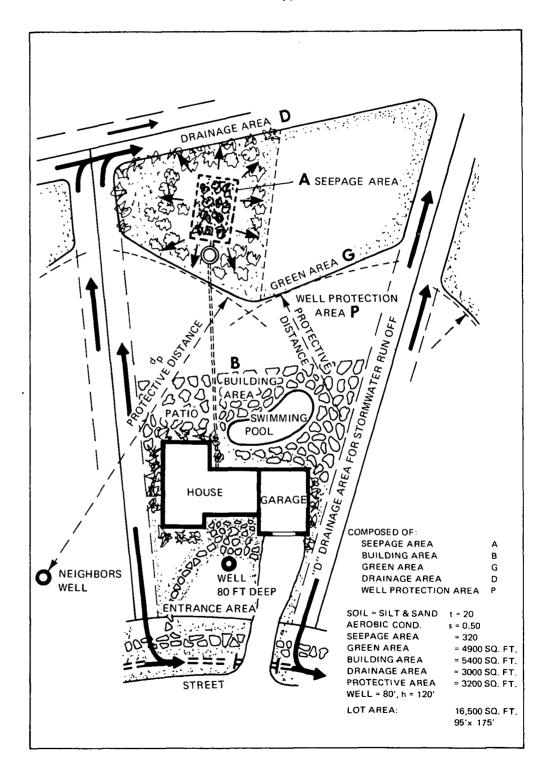
**Property Sizes** 

#### Step 1: The Seepage Bed Area

The seepage bed area, as a vital part of the green area, serves to filter the preconditioned wastewater, infiltrate it into the soil and evapotranspirate it into the air.

The calculation of the seepage area is based on these parameters:

- type of soil
- pollution load of the wastewater
- biological condition of the wastewater
- climatic and surface conditions
- design characteristics of the seepage bed
- flow quantity of wastewater



$$A = \frac{F \cdot L}{S}$$

A = area of seepage bed, in square feet

F = flow of wastewater, in gallons per day

L = pollution load of the wastewater (a factor)

$$=\frac{BOD+SS}{120}$$

S = seepage rate in gallons per square foot per day

 $S_i$  (infiltration)  $+S_o$  (evapotranspiration)

(a) The **type of soil** can be determined by the percolation test. As outlined in a separate chapter, the proposed indicator is the time "t" in minutes which is needed for the water table of clean water to sink one inch. For example, a loam-silt mixture has a percolation time "t" of 45 minutes per inch.

(b) The **pollution load** L depends on the selected treatment, either aerobic or anaerobic-septic (Figures 2a and 2b). The L value of the treatment unit should be pre-established by a permanent unit-certificate or by individual effluent tests. For example, the L value may be 1.0 for aerobic units (BOD = 50, SS = 70) or it may be 1.8 for anaerobic-septic tanks (BOD = 150, SS = 70).

(c) The **design of the seepage bed** can stimulate or prevent aerobic biological conditions (Figure 3). Aerobic conditions are superior for the purpose of wastewater disposal because of the more balanced prey-predator relations among the microorganisms. A constant opening of soil pores thus occurs, together with an increase in temperature.

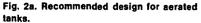
(d) The *infiltration rate*  $S_i$  (in gallons per square foot per day)\* depends on the soil type and on the biological condition of the wastewater. Values derived from experiments at the University of Toronto and from field studies in southern Ontario are tabulated in Table 1. For example, for a loam-silt mixture with t = 45 minutes, the infiltration rate is 0.28 gal/sq. ft. day for aerobic conditions and 0.10 gal/sq. ft. day for anaerobic-septic conditions.

(e) The **evapotranspiration rate**  $S_e$  (in gallons per square foot per day) depends on the surface planting of the seepage bed; on the permissible rise of the wastewater table below the surface, (the ground becomes spongy, for example, if the wastewater table rises to within 2" below the surface); and again on the biological condition of the wastewater. The energy production by aerobic microorganisms is vital for the high evaporation rate, which occurs under aerobic wastewater conditions.

Evapotranspiration rates are tabulated in Table 2. If, for example, the wastewater table in a welllandscaped seepage bed with aerobic conditions should be 6" to 9" below the surface during summer, the evapotranspiration rate is 0.11 gal/sq. ft. day. If, in the same bed, the wastewater table could be permitted to rise to 2" to 3" below the surface during winter, the evapotranspiration is 0.08 gal/sq. ft. day. Thus the annual average is about 0.10 gal/sq. ft. day.

For anaerobic-septic conditions the respective figures would be 0.02 and 0.01 gal/sq. ft. day, with an annual average of 0.016 gal/sq. ft. day.

\*Note: All volumes in Imperial gallons: 1 gal (Imp.)=1.2 gal (U.S.)



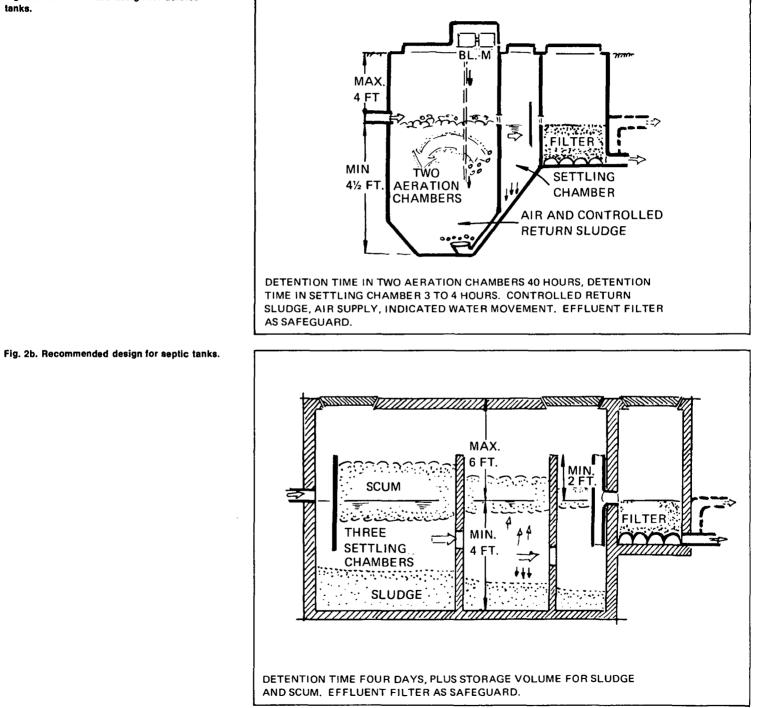
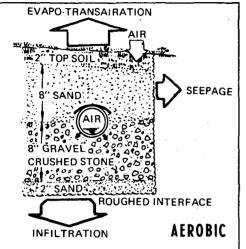
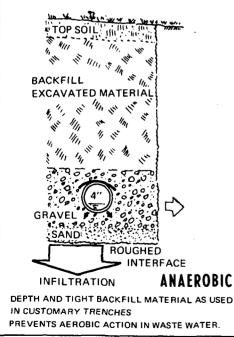


Fig. 3. Aerobic Seepage Bed or Trench, Anaerobic Seepage Bed or Trench.



THE BED IS SHALLOW AND COVERED WITH SAND AND GRASS, FOR AERATION FROM THE SURFACE AND FOR EVAPO-TRANSPIRATION. SAND REACHES DOWN TO DISTRIBUTION PIPE FOR CAPILLARIC RISING OF WASTEWATER. TAR PAPER PROTECTS JOINTS AND OPENINGS OF PIPES AGAINST SAND FALLING INTO PIPES. SURFACE OF ORIGINAL SOIL IS "ROUGHED" -A SEPARATE CONSTRUCTION PROCESS.



(f) The combined seepage rate S is the sum of  $S_i$  and  $S_e$  in gal/sq. ft. day. The rates are diagramatically shown in Figure 4 for a well-planted seepage bed surface and a wastewater table 6" to 9" below the surface during summer and 2" to 3" below the surface in winter.

# Table 1. Soil Infiltration Rates.

For Various Soils

For Aerobic and Anaerobic Conditions

|                                       |                                | Infiltration Rate (gal/sq. ft. day) |                             |                |  |  |  |
|---------------------------------------|--------------------------------|-------------------------------------|-----------------------------|----------------|--|--|--|
| Type of Soil                          | Percolation Time<br>(min./in.) | Aerobic<br>S <sub>1</sub>           | Anaerobic<br>S <sub>i</sub> | Clean<br>Water |  |  |  |
| Sand                                  |                                |                                     |                             |                |  |  |  |
| 0.3-1.0 mm                            | 1                              | 0.57                                | 0.53                        | 754            |  |  |  |
| Sand<br>0.1-0.9 mm                    | 5                              | 0.54                                | 0.45                        | 151            |  |  |  |
| Fine sand, garden<br>soil 0.05-0.8 mm | 10                             | 0.50                                | 0.37                        | 75             |  |  |  |
| Fine sand                             | 15                             | 0.46                                | 0.29                        | 50             |  |  |  |
| Silt and sand                         | 20                             | 0.42                                | 0.24                        | 37             |  |  |  |
| Silt                                  |                                |                                     |                             |                |  |  |  |
| 0.01-0.7 mm                           | 30                             | 0.36                                | 0.17                        | 25             |  |  |  |
| Loam and silt                         | 45                             | 0.28                                | 0.10                        | 17             |  |  |  |
| Loam, silt and clay                   | 60                             | 0.23                                | 0.06                        | 12.5           |  |  |  |
| Clay and silt<br>0.05-0.5 mm          | 90                             | 0.15                                | 0.02                        | 8.5            |  |  |  |
| Clay, shale                           | · 120                          | 0.10                                | 0.00                        | 6.2            |  |  |  |

Note: 1 gal/sq.ft.day = 57.7"/month

# Table 2. Evapotranspiration Rates.

For Different Bed Surfaces, Variable Wastewater Tables, Aerobic and Anaerobic Conditions

|                          |                                |               |                                        | potranspi   | ration Rate S <sub>e</sub>          |                                 |                                         |                                |                                     |  |  |
|--------------------------|--------------------------------|---------------|----------------------------------------|-------------|-------------------------------------|---------------------------------|-----------------------------------------|--------------------------------|-------------------------------------|--|--|
| Distance<br>from         |                                |               | Aerobic                                |             |                                     |                                 | Anaerobic                               |                                |                                     |  |  |
| Surface to<br>Wastewater | Surface<br>Treatment<br>of Bed | for<br>Summer | Average<br>for<br>Winter<br>/sq. ft. d | for<br>Year | Average<br>for<br>Year<br>(in./mo.) | Average<br>for<br>Summer<br>(ga | Average<br>for<br>Winter<br>I/sq. ft. d | Average<br>for<br>Year<br>lay) | Average<br>for<br>Year<br>(in./mo.) |  |  |
| 2 to 3                   | Grass,<br>shrubs               | 0.18          | 0.08                                   | 0.13        | 7.5                                 | 0.07                            | 0.01                                    | 0.04                           | 2.3                                 |  |  |
| 2 to 3                   | Bare                           | 0.11          | 0.03                                   | 0.07        | 4.0                                 | 0.03                            | 0.006                                   | 0.02                           | 1.2                                 |  |  |
| 6 to 9                   | Grass,<br>shrubs               | 0.11          | 0.02                                   | 0.07        | 4.0                                 | 0.02                            | 0.004                                   | 0.012                          | 0.7                                 |  |  |
| 6 to 9                   | Bare                           | 0.06          | 0.01                                   | 0.04        | 2.3                                 | 0.005                           | 0.002                                   | 0.004                          | 0.2                                 |  |  |

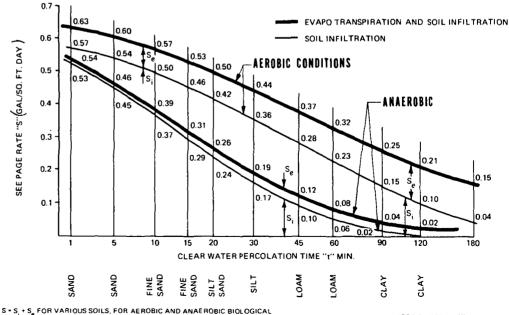
For example:

S = 0.37 gal/sq. ft. day for aerobic conditions and S = 0.12 gal/sq. ft. day for anaerobic conditions both for a loam-silt mixture (t= 45 min.).

(g) The **quantity or flow of wastewater** F depends on the habits of the residents in the home. The average flow from an average household is about 160 gal/day. Large households or high-income families use 25 to 50% more water; small and low-income families use 10 to 20% less.

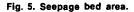
(h) The **seepage bed areas**, as the result of  $A = \frac{F \cdot L}{S}$ , are tabulated in Table 3 and diagramatically shown in Figure 5 for F = 160 gal/day; for L = 1.0 for aerobic and L = 1.8 for anaerobic conditions; and for  $S_e$  as indicated in paragraph 3. For our example of an average household with F = 160 on a lot with a soil of loam and silt (t = 45), the seepage bed areas are:

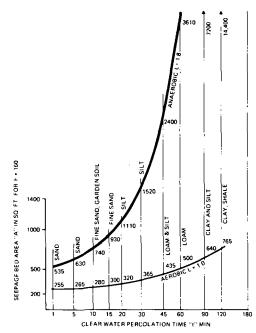
 $A = \frac{160 \times 1.0}{0.37} = 435 \text{ sq. ft. for aerobic conditions}$ and  $A = \frac{160 \times 1.8}{0.12} = 2400 \text{ sq. ft. for anaerobic conditions}$ 



CONDITIONS, FOR WELL PLANTED SEEPAGE BED SURFACE, FOR WASTE WATER TABLE BELOW SURFACE : 6" -9" DURING SUMMER, 2" - 3" DURING WINTER "FOR F = 160, g = 1" S<sub>e</sub> = 0.06 ~ 0.11 AEROBIC S<sub>a</sub> = 0.01 ~ 0.02 ANAEROBIC

Fig. 4. Combined seepage rates.





| Table 3. Area of Seepage B | ed. |
|----------------------------|-----|
|----------------------------|-----|

$$A = \frac{F \cdot L}{S}$$

(S as shown in Figure 4)

|               |     |                           | OBIC<br>0, L = 1 | ANAEROBIC $F = 160, L = 1.8$ |                |  |
|---------------|-----|---------------------------|------------------|------------------------------|----------------|--|
|               |     | S<br>(gal/sq.<br>ft./day) | A<br>(sq. ft.)   | S<br>(gal/sq.<br>ft./day)    | A<br>(sq. ft.) |  |
| Sand          | 1   | 0.63                      | 255              | 0.54                         | 535            |  |
| Sand          | 5   | 0.60                      | 265              | 0.46                         | 630            |  |
| Fine sand     | 10  | 0.57                      | 280              | 0.39                         | 740            |  |
| Fine sand     | 15  | 0.53                      | 300              | 0.31                         | 930            |  |
| Silt and sand | 20  | 0.50                      | 320              | 0.26                         | 1110           |  |
| Silt          | 30  | 0.44                      | 365              | 0.19                         | 1520           |  |
| Loam and silt | 45  | 0.37                      | 435              | 0.12                         | 2400           |  |
| Loam          | 60  | 0.22                      | 500              | 0.08                         | 3610           |  |
| Clay and silt | 90  | 0.25                      | 640              | 0.04                         | 7200           |  |
| Clay          | 120 | 0.21                      | 765              | 0.02                         | 14400          |  |

 $A = \frac{FL}{S} = FOR | VARIOUS | TYPES OF SOILS | FOR F + 160 GAL/DAY, \\ L = 1.0 | AND | 1.8, S | AS | TABULATED | IN | TABLE E$ 

# Step 2: The Green Area

The main purpose of the green area is the disposal of wastewater by soil infiltration and by evapotranspiration. It contains, as major features, the seepage bed and a safety area around it. The portion of the wastewater which has filtrated horizontally away from the seepage bed is evapotranspirated and soil-infiltrated in the safety area.

Both the seepage bed and the safety area are surface-graded to slope towards the drainage area for fast discharge of storm water. The layout and spatial arrangement within the green area should be such that a complete new seepage bed, including its safety area, can be constructed in case of unforeseen failure of the first installation.

The green area, in particular the seepage bed and the safety area, should be grass covered and heavily planted with bushes and small trees. Existing large trees greatly help evapotranspiration and should therefore be preserved.

No buildings, slabs, flagstone patios, pavement, tennis courts, or swimming pools are permitted in the green area. Gravelled surfaces should be kept to a minimum. The green area, especially the seepage bed area and the safety area, cannot be used as a playground or active sports area.

If calculated, the equation for the green area G in square feet is:

$$G = (4,000 + \frac{A}{S^{\frac{1}{2}}}) \frac{F}{160}$$

A = seepage area in square feet (as in Table 2 and Figure 5)

 $S \equiv$  seepage rate,  $S_1 + S_{\rm e}$  aerobic or anaerobic (as in Tables 1 and 2 and Figure 4)  $F \equiv$  Flow of wastewater

In our example for a soil with t = 45 min, for F = 160 gal/day,

for aerobic conditions: A = 435 sq. ft., S = 0.37, G =  $\thicksim$  5950 sq. ft.

for anaerobic conditions: A = 2400 sq. ft., S = 0.12, G = 61,500 sq. ft.

The required area is considerably smaller if the wastewater is in an aerobic biological condition, compared to the larger area requirement, if anaerobic-septic conditions prevail. The reason is the significantly higher amount of energy produced by aerobic microorganisms, which translates into increased temperature and intenser evaporation. Also, the larger aerobic microorganisms (the protozoa) feed on the smaller but vastly more numerous bacteria, keeping their number in check and thus re-opening the soil pores, which may be plugged by clusters of bacteria.

Depending on the biological condition of the wastewater, as well as on the type of soil, some figures for green areas are tabulated in Table 4.

The design procedure is:

107

- (a) Dimension for seepage bed, for example for the aerobic bed of 435 sq. ft.  $\pm$  30 ft.  $\times$  15 ft.
- (b) "Safety frame" around seepage bed (wider if seepage rate is lower, as indicated in Figure 6):

Width of frame in ft. 
$$f = \frac{6 \text{ ft.}}{S}$$

In our example for aerobic conditions, the width of the frame

$$=\frac{6 \text{ ft.}}{\text{S}}=16 \text{ ft.}$$

#### Table 4. Green Area.

(square feet)

For F = 160 gal/day, S as in Figure 4.

|               | Percolation Time- | Seepa   | ge Rate   | Green Area |           |  |
|---------------|-------------------|---------|-----------|------------|-----------|--|
| Type of Soil  | (t in min.)       | Aerobic | Апаегоріс | Aerobic    | Anaerobic |  |
| Sand          | 1                 | 0.63    | 0.54      | 4510       | 5360      |  |
| Sand          | 5                 | 0.60    | 0.46      | 4580       | 6020      |  |
| Fine sand     | 10                | 0.57    | 0.39      | 4660       | 7040      |  |
| Fine sand     | 15                | 0.53    | 0.31      | 4770       | 9400      |  |
| Silt and sand | 20                | 0.50    | 0.26      | 4910       | 12,350    |  |
| Silt          | 30                | 0.44    | 0.19      | 5250       | 22,300    |  |
| Loam and silt | 45                | 0.37    | 0.12      | 5950       | 61,500    |  |
| Loam          | 60                | 0.32    | 0.08      | 6800       | 164,000   |  |
| Clay and silt | 90                | 0.25    | 0.04      | 9140       | _         |  |
| Clay          | 120               | 0.21    | 0.02      | 12,000     | _         |  |

#### 108

#### Appendix A

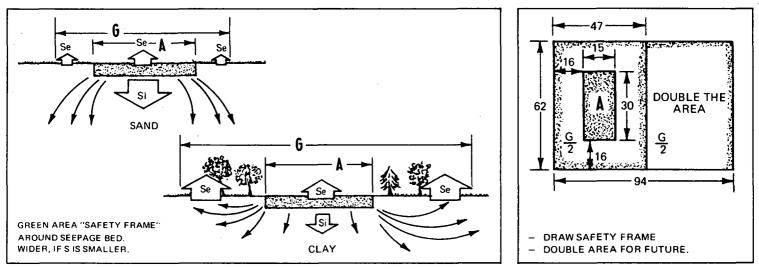
(c) Area of seepage bed plus safety frame (Figure 7) is:

62 ft.  $\times$  47 ft = 2920 sq. ft.

Fig. 6. Green area "safety frame".

(d) Doubling the area to allow a possible reconstruction of the seepage area (Figure 7):

2920 sq. ft.  $\times$  2 = 5840 sq. ft.



# Step 3: The Drainage Area

The drainage area serves to channel all stormwater runoffs and snow melting water quickly away from the property. In most cases, the drainage area forms a "frame" of grassed shallow swales around the property (Figure 1). Green area and building area are graded to slope directly towards the drainage swales. The drainage areas of all lots of a subdivision combine in a surface drainage system, which generally adheres to the natural topography (Figure 8).

No obstructions of the flow of water are permissable; neither are patios, buildings, or long pipes. At driveways and road crossings, culverts of a maximum length of 40 feet are permissible.

Under near ideal topographic conditions, such as a gentle slope of the land between 1 per cent and 2 per cent, the width of the drainage frame is about 10 feet. If the natural slope is too flat or too steep, much wider drainage strips are required. In a very flat area, for example, the main drainage ditch has to be 3 feet deep after 400 feet of flow. This requires a strip of 26 feet width, perhaps shared by two lots (Figure 9).

Wider strips are also required for steep sites, where small steps or waterfalls may be needed to break the water velocity. The bottom of the ditch should always be entirely within the uphill lot (Figure 9). In steep terrain, the drainage area may be reduced by installing retaining walls (Figure 9).

It is assumed that biological conditions in the storm water swales will always be aerobic, regardless of the biological condition of the domestic wastewater, since the storm water contains dissolved oxygen. Therefore the aerobic seepage rate is applied for that portion of the storm water which infiltrates and evapotranspirates.

#### Fig. 8. Drainage areas.

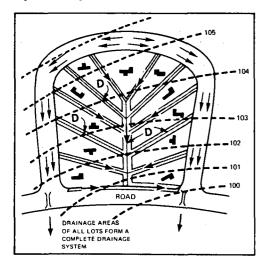
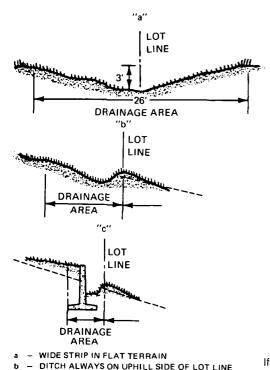


Fig. 7. Design of green area.





SLOPE OF GROUND g 1%-2% 1.0 1/2-1% 2-31/2% 1.6 1/4 - 1/2% 3½-5% 2.9 1/8-1/4% 5-7% 3.4 < 1/8% 7-8% 4.3 4.0 ຼຸ່ຫ 3.0 GRADE FACTOR 2.0 1.0 1/8 1/4 1/2 1% 2% 3% 4% 5 6 7 8% GRADE OR SLOPE OF THE LAND

If calculated, the equation for the Drainage Area D in square feet is:

RETAINING WALL MAY REDUCE DRAINAGE AREA IN STEEP TERRAIN

 $D = 1500 \frac{g}{s}$ aerobic

g = grade factor = 1.0 for ideal slopes, increasing up to 4.5 for flat and for steep terrain (see Figure 10)

S = seepage rate (see Table 5)

In our example for a loam-silt mixture with t = 45 min and for a natural slope of the land between 1% and 2%, the drainage area is:

D = 1500 × 
$$\frac{1.0}{0.37}$$
 = 4080 sq. ft.

This is, for a green area of 62 ft.  $\times$  94 ft. and the anticipated building area of 62 ft.  $\times$  70 ft., a frame of a width of 10 ft. to 11 ft. The width of the drainage "frame" would be much narrower, e.g., only 4 feet around the larger green areas required if wastewater conditions are anaerobic. Calculated drainage areas for prevailing conditions are tabulated in Table 5.

If designed, the drainage area "frame" could be plotted around the green area. For example, with a drainage area of 62 ft.  $\times$  94 ft. and a predesigned building area of, for example, 4000 sq. ft. (approx. 62 ft. × 65 ft.), if the width of the frame is chosen as 10 feet, the drainage area would be about 3000 sq. ft. (see Figure 11).

109

#### Fig. 10. Grade factor for drainage area.

# Table 5. Drainage Area.

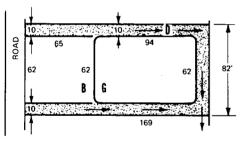
For various types of soil; for aerobic and for anaerobic conditions

Calculated in square feet as: D = 1500 x  $\frac{g}{s}$ 

For S as shown in Figure 4; F = 160 gal/day; g (grade factor) = 1.0

| Type of<br>Soil | Percolation<br>Time<br>(t in min.) | Seepage<br>Rate<br>aerobic | Drainage<br>Area<br>aerobic<br>anaerobic |
|-----------------|------------------------------------|----------------------------|------------------------------------------|
| Sand            | 1                                  | 0.63                       | 2600                                     |
| Sand            | 5                                  | 0.60                       | 2800                                     |
| Fine sand       | 10                                 | 0.57                       | 3000                                     |
| Fine sand       | 15                                 | 0.53                       | 3200                                     |
| Silt and sand   | 20                                 | 0.50                       | 3600                                     |
| Silt            | 30                                 | 0.44                       | 4200                                     |
| Loam and silt   | 45                                 | 0.37                       | 5400                                     |
| Loam            | 60                                 | 0.32                       | 6500                                     |
| Clay and silt   | 90                                 | 0.25                       | 10,000                                   |
| Clay            | 120                                | 0.21                       | 15,000                                   |
|                 |                                    |                            |                                          |

#### Fig. 11. Drainage area.



FORMS A "FRAME" AROUND LOT

#### Step 4: The Building Area

In the building area are located the house, garages, driveway, swimming pool, terraces, patios, tennis courts, etc. Also part of the building area, for this purpose, is the setback or entrance area which is needed for aesthetic, architectural reasons. Also contained in the building area, far away from the green area, is the water supply well.

**Individual design** is the best way to establish the building area (Figure 1). The design should consider all needs of the home owner and should include possibilities for future expansion of house, garage, etc. If land area is very expensive, a "no expansion" agreement may replace the latter consideration.

The **tabulated figures** (Table 6) are another alternative to finding the building area. The expected types of houses and activities are the proposed parameters. Again, the proposed "expansion safety" percentage and perhaps part of the pool-patio area-allotment could be eliminated by a "no expansion" agreement.

For overall calculations of the building area B in square feet, two equations are offered.

$$B = 2000 + \frac{G}{2.5} + \frac{D}{5}$$
 or  $B = 4000 + \frac{G+D}{5}$ 

The equation which leads to a smaller building area governs. In our example, G = 5800 sq. ft., D = 4080 sq. ft., B =  $200 + \frac{9880}{2.5} = 6000$  sq. ft., or B =  $4000 + \frac{9880}{5} = 6000$  sq. ft. The result is the same in either equation (Table 7).

# Table 6. Building Area.

(square feet)

| Size of Home      | Floor Area<br>Outside<br>Measurement | Garage<br>and<br>Driveway | Patios<br>and<br>Pool | 20%<br>Safety<br>Expansion | Entrance<br>or Front<br>Yard | Building<br>Area |
|-------------------|--------------------------------------|---------------------------|-----------------------|----------------------------|------------------------------|------------------|
| Small house       | 1500                                 | 500                       | 500                   | 500                        | 1000                         | 4000             |
| Medium house      | 2000                                 | 700                       | 1000                  | 800                        | 2500                         | 7000             |
| Large house       | 3000                                 | 1000                      | 1500                  | 1100                       | 5000                         | 12000            |
| Estate-type house | 4000                                 | 2000                      | 3000                  | 2000                       | 8000                         | 19000            |

#### Table 7. Building areas.

(square feet)

For F = 160 gal/day, S as in Figure 4.

|               | Percolation -    | Seepa   | ge Rate   | <b>Building Areas</b> |           |  |
|---------------|------------------|---------|-----------|-----------------------|-----------|--|
| Type of Soil  | Time (t in min.) | Aerobic | Anaerobic | Aerobic               | Anaerobic |  |
| Sand          | 1                | 0.63    | 0.54      | 4860                  | 5180      |  |
| Sand          | 5                | 0.60    | 0.46      | 4960                  | 5540      |  |
| Fine sand     | 10               | 0.57    | 0.39      | 5060                  | 6080      |  |
| Fine sand     | 15               | 0.53    | 0.31      | 5300                  | 6520      |  |
| Silt and sand | 20               | 0.50    | 0.26      | 5420                  | 7200      |  |
| Silt          | 30               | 0.44    | 0.19      | 5880                  | 9300      |  |
| Loam and silt | 45               | 0.37    | 0.12      | 6270                  | 17,400    |  |
| Loam          | 60               | 0.32    | 0.08      | 6660                  | 38,200    |  |
| Clay and silt | 90               | 0.25    | 0.04      | 7840                  |           |  |
| Clay          | 120              | 0.21    | 0.02      | 9400                  |           |  |

#### Step 5: The Well Protection Area

If the water for the neighborhood is supplied by individual wells and if the wastewater is disposed by individual infiltration beds, an additional well protection area assures that the necessary protection distance exists between the intake of each homeowner's well and his neighbour's wastewater infiltration beds.

An additional well protection area is not required if:

- (a) the neighbourhood is supplied from a municipal water system;
- (b) the wastewater is not infiltrated into the ground, for example, if it is entirely evapotranspirated;

(c) the water supply well is deep enough and the lot is large enough so that the protective distance is "built-in," meaning that it exists without allocating an additional area.

Seeping downward through a variety of soil strata, the wastewater is purified by a combination of physical, biological and chemical forces. For this purification, vertical travel is much more effective

than horizontal travel. Most physical and bio-degradable impurities have usually disappeared after a vertical infiltration of 8 to 12 feet, while chemical pollutants and viruses are more persistant and can be detected down to 25 to 30 feet of depth. Consequently, the depth of a well is extremely important in preventing its pollution by infiltrated wastes.

Another important factor for the purification is the type of soil, fine grained and fine pored soils offering much superior elimination of pollutants. Thus clay and silt are much better than sand in this case.

The worst possibility of well pollution occurs if the wastewater flows toward the well in a soil crevice, without any purification occurring. Where such soil conditions exist, total evapotranspiration of the wastewater is one possible answer.

The horizontal protective distance (Figure 12) can be calculated as:

 h = horizontal protective distance in feet; measured from the water supply well to the nearest limit of any neighbour's "green area." The distance to the owner's "green area" should be about 15% to 20% shorter, so any indication of wastewater pollution of the well would come from the owner's sewage.

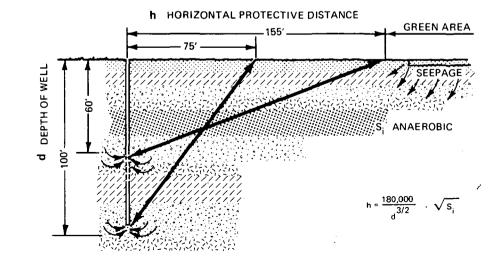
$$h = \frac{180,000\sqrt{s_1}}{d\%}$$

d = depth of well, in feet; most likely a drilled well of a diameter of only a few inches.

s<sub>1</sub> = anaerobic infiltration rate, in gal/sq.ft./ day, average for all soil strata encountered while drilling the well.

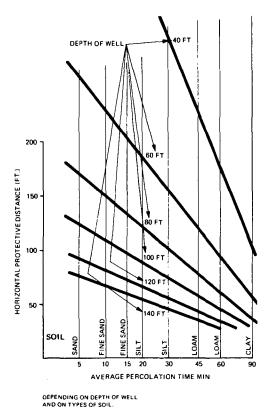
The required horizontal protective distances are tabulated in Table 8 and diagrammatically shown in Figure 13, for various depths of wells and for various types of soil, whereby the percolation time is the average of all soil strata encountered during well drilling.

Properly, lots of reasonable proportions, such as a width to length ratio of 1:2 to 3.5:4 have a built-in protective distance, if the water supply well is located in front of the house at a setback



#### Fig. 12. Horizontal Protective Distance.

#### Fig. 13. Horizontal protective distance.



#### Table 8. Horizontal Protective Distances.

(h for Wells)

For various depths and soils

 $h = \frac{180,000}{d^{1/2}}\sqrt{s_i}$  (horizontal protective distance in feet)

d = depth of well in feet

 $s_i = infiltration rate, anaerobic, in g/sq. ft.$ 

|              | Percolation<br>Time | Coopera Pata               |     |     | Depth ( |     |     |     |
|--------------|---------------------|----------------------------|-----|-----|---------|-----|-----|-----|
| Type of Soil | (t in min.)         | Seepage Rate_<br>anaerobic | 40  | 60  | 80      | 100 | 120 | 140 |
| Sand         | 5                   | 0.45                       | 480 | 260 | 170     | 120 | 90  | 75  |
| Fine sand    | 10                  | 0.37                       | 430 | 235 | 150     | 110 | 85  | 66  |
| Fine sand    | 15                  | 0.29                       | 380 | 210 | 135     | 100 | 75  | 60  |
| Silt         | 20                  | 0.24                       | 350 | 190 | 125     | 90  | 65  | 55  |
| Silt         | 30                  | 0.17                       | 295 | 160 | 105     | 75  | 55  | 45  |
| Loam         | 45                  | 0.10                       | 225 | 120 | 80      | 60  | 45  | 35  |
| Loam         | 60                  | 0.06                       | 175 | 95  | 60      | 45  | 35  | 30  |
| Clay         | 90                  | 0.04                       | 140 | 80  | 50      | 35  | 30  | 20  |

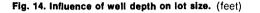
of about 20 feet. For our example, for soil strata of loam and silt mixture and with aerobic wastewater conditions (total lot area 17,600 sq. ft., the built-in horizontal protective distance, h, is 120 feet. Tabulated in Table 9 are all built-in horizontal protective distances, depending on soil types and biological wastewater conditions.

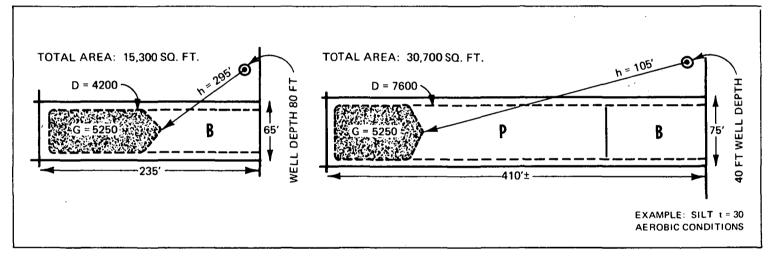
Therefore, no additional well protection area P is needed if the horizontal protection distance as calculated, or as tabulated in Table 8, is shorter than the built-in protection distance as tabulated in Table 9.

|               |                                    | Aerobic ( | Conditions                         | Anaerobic Conditions |                                     |  |
|---------------|------------------------------------|-----------|------------------------------------|----------------------|-------------------------------------|--|
| Type of Soil  | Percolation<br>Time<br>(t in min.) | Lot Size  | Built-In<br>Protective<br>Distance | Lot Size             | Built-In"<br>Protective<br>Distance |  |
| Sand          | 1                                  | 60 x 200  | 75-80                              | 60 x 220             | 85-90                               |  |
| Sand          | 5                                  | 60 x 200  | 80-85                              | 62 x 230             | 90-95                               |  |
| Fine sand     | 10                                 | 60 x 212  | 85-90                              | 65 x 248             | 95-105                              |  |
| Fine sand     | 15                                 | 60 x 222  | 85-90                              | 75 x 256             | 110-125                             |  |
| Silt and sand | 20                                 | 62 x 226  | 90-95                              | 80 x 290             | 120-140                             |  |
| Silt          | 30                                 | 65 x 235  | 95-105                             | 95 x 380             | 130-150                             |  |
| Loam and silt | 45                                 | 70 x 252  | 100-120                            | 150 x 562            | 140-160                             |  |
| Loam          | 60                                 | 75 x 266  | 125-135                            | 220 x 946            | 170-190                             |  |
| Clay and silt | 90                                 | 80 x 340  | 140-150                            |                      | _                                   |  |
| Clay          | 120                                | 85 x 384  | 155-165                            |                      | —                                   |  |

#### Table 9. "Built-In" Horizontal Protective Distances Between Well and Green Area.

An additional well protection area is required, however, if the built-in protective distance (Table 9) is shorter than the required protective distance (Table 8). This can be done by design, as indicated in Figure 14. For example, the total area B + G + D of a lot in silty soil (t = 30) and with aerobic wastewater condition is 15,300 sq. ft. (Tables 4, 5, 7). It has a "built-in" horizontal protective distance of 105 feet. The required horizontal protective distance for an 80 foot well in similar soil strata is 100 feet (Table 8). In this case, no additional well protection area is needed (Figure 14). If, however, a 40 foot well would be selected under the same conditions, a horizontal protective distance of 295 feet (Table 10) would be needed. To achieve this distance between well and green area, an additional well protection area P of 12,000 sq. ft. is required (Figure 14). Also, the drainage area increases by about 34,000 sq. ft., thus making the total required lot area 307.000 sq. ft.





| Type of Soil | Percolation<br>Time<br>(t in min.) | Aerobic | Anaerobic<br>140 |  |
|--------------|------------------------------------|---------|------------------|--|
| Sand         | 1                                  | 140     |                  |  |
| Sand         | 5                                  | 130     | 120              |  |
| Fine sand    | 10                                 | 120     | 120              |  |
| Fine sand    | 15                                 | 120     | 100              |  |
| Silt         | 20                                 | 100     | 80               |  |
| Silt         | 30                                 | 80      | 70               |  |
| Loam         | 45                                 | 60      | 60               |  |
| Loam         | 60                                 | 50      | 50               |  |
| Clay         | 90                                 | 40      |                  |  |
| Clay         | 120                                | 40      |                  |  |

| Table 10. | Minimum | Depth | of Well | Without | Protection | Area. |
|-----------|---------|-------|---------|---------|------------|-------|
| 140.041   |         | •     |         |         |            |       |

It follows that under the same soil conditions, a shallower well requires a larger lot size. In other words, deeper wells can be used to reduce the lot sizes. The minimum well depths which do not require additional well protection area for various soil conditions are tabulated in Table 10.

There are no restrictions for the surface of the well protection area. It can be used as an extension of the building area or for active sports or similar activities.

Summary

| Lot = G + D + B + P                                    | G = Green area                           |
|--------------------------------------------------------|------------------------------------------|
| A F                                                    | D — Drainage area                        |
| $G = (4000 + \frac{A}{5 \frac{4}{3}}) \frac{F}{160}$   | B — Building area                        |
| $A = \frac{F.L.}{S}$                                   | P = Well protection area                 |
| $A = \frac{1}{S}$                                      | A = Seepage bed area                     |
| $D = 1500 \cdot \frac{g}{S}$                           | F = Flow of wastewater                   |
| B = 1000 S                                             | L = Pollution load of treated wastewater |
| $B = 2000 + \frac{G + D}{25}$                          | $S = Seepage rate S_1 + S_{\bullet}$     |
| 2.0                                                    | $S_1 = Infiltration rate$                |
| or = $4000 + \frac{G+D}{5}$                            | S. = Evapotranspiration rate             |
| Ū                                                      | g = grade factor                         |
| $h = \frac{180,000 \cdot \sqrt{S_1}}{d^{\frac{3}{2}}}$ | h = horizontal protective distance       |
| d⊁                                                     | d = depth of water supply well           |

A summary of total lot areas for various soil conditions and for aerobic and anaerobic-septic biological conditions are tabulated in Table 11 and are diagrammatically shown in Figure 15, without additional well protection area (P = 0) and for F = 160, g = 1.0,  $S_e = 0.06-0.11$  (aerobic) and  $S_e = 0.01-0.02$  (anaerobic). Also listed in Table 11 are the "built-in" horizontal protective distances and the corresponding minimum depth of water supply wells. A visual comparison of lot sizes for aerobic and anaerobic conditions is attempted in Figure 16.

The increase in lot size, if a well protection area P is required, is illustrated in Figure 17. The lot size in a district with silty soil (t = 30) and with aerobic wastewater conditions, for example, is 15,300 sq. ft. or 65 ft.  $\times$  235 ft. Such a lot has a "built-in" protective distance of about 100 ft., which means that no additional well protection area is required if the well is 80 ft. deep (Table 8).

If the well is only 60 ft. deep, the required horizontal protective distance is 155 ft., and thus an additional well protection area of 4200 sq. ft. is needed. The total lot area is now 19,500 sq. ft. or 75 ft.  $\times$  260 ft. As another example (Figure 17), if the district's soil is loam with silt (t = 45), the lot size is 17,700 sq. ft. or 70 ft.  $\times$  252 ft., with a built-in h = 120. Thus the minimum well depth is 60 ft. If the well is only 40 ft. deep, h becomes 230 ft., which requires an area P of 10,400 sq. ft., for a total lot area of 28,000 sq. ft. or 85 ft.  $\times$  230 ft.

EXAMPLE: Lot size determination for a lake area cottage subdivision in the Muskoka Recreational District about 140 miles north of Toronto.

Conditions:

-Soil: rock, gently sloping towards the lake with about 12 feet of sandy topsoil above the rock.

<sup>-</sup>Layout: all lots front on the lake.

-Water supply: individual units, pumping water from the lake.

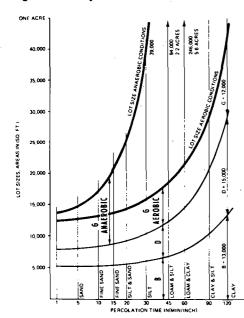
---Wastewater disposal: entirely by evapotranspiration.

Decision or assumptions:

—Water consumption and wastewater flow per cottage: F = 160 gal per day.

—To be installed: an aerobic treatment unit, which reduces the pollution load to  $BOD = \sim 50 \text{ mg/l}$  and  $SS = \sim 70 \text{ mg/l}$  for an L value of 1.

#### Fig. 15. Summary of lot areas.



FOR VARIOUS SOLLS AND ANAEROBIC/AEROBIC CONDITION WITH MINIMUM DEPTH OF WELLS ESTABLISHED BY "BUILTIN" PROTECTIVE DISTANCE OR FOR "NO WELLS" DEVELOPMENTS Table 11. Summary of Lot Areas.

|                         | Time | age ( |        | G D<br>q. ft.) (sq. ft.) |                  | Lot Area    |             | Well                            |                |
|-------------------------|------|-------|--------|--------------------------|------------------|-------------|-------------|---------------------------------|----------------|
|                         |      |       | G      |                          | B<br>) (sq. ft.) | ) (sq. ft.) | (ft. x ft.) | Protective<br>Distance<br>(ft.) | Depth<br>(ft.) |
| AEROBIC<br>CONDITIONS   |      |       |        |                          |                  |             |             |                                 |                |
| Sand                    | 1    | 0.63  | 4510   | 2600                     | 4860             | 12000       | 60 x 200    | 75-80                           | 140            |
| Loam and silt           | 45   | 0.60  | 4580   | 2800                     | 4960             | 12300       | 60 x 206    | 80-85                           | 130            |
| Sand                    | 5    | 0.57  | 4660   | 3000                     | 5060             | 12700       | 60 x 212    | 85-90                           | 120            |
| Fine sand               | 10   | 0.53  | 4770   | 3200                     | 5300             | 13300       | 60 x 222    | 85-90                           | 120            |
| Fine sand               | 15   | 0.50  | 4910   | 3600                     | 5420             | 14000       | 62 x 226    | 90-95                           | 100            |
| Silt and sand           | 20   | 0.44  | 5250   | 4200                     | 5880             | 15300       | 65 x 235    | 95-105                          | 80             |
| Silt                    | 30   | 0.37  | 5950   | 5400                     | 6270             | 17600       | 70 x 252    | 100-120                         | 60             |
| Loam                    | 60   | 0.32  | 6800   | 6500                     | 6660             | 19900       | 75 x 266    | 125-135                         | 50             |
| Clay and silt           | 90   | 0.25  | 9140   | 10000                    | 7840             | 27000       | 80 x 340    | 140-150                         | 44             |
| Clay                    | 120  | 0.21  | 12000  | 15000                    | 9400             | 36400       | 95 x 384    | 155-165                         | 40             |
| ANAEROBIC<br>CONDITIONS |      |       |        |                          |                  |             |             |                                 |                |
| Sand                    | 1    | 0.54  | 5360   | 2600                     | 5180             | 13100       | 60 x 220    | 85 90                           | 140            |
| Sand                    | 5    | 0.46  | 6020   | 2800                     | 5540             | 14300       | 62 x 230    | 90-95                           | 120            |
| Fine sand               | 10   | 0.39  | 7040   | 3000                     | 6080             | 16100       | 65 x 248    | 95-105                          | 120            |
| Fine sand               | 15   | 0.31  | 9400   | 3200                     | 6520             | 19100       | 75 x 256    | 110-125                         | 100            |
| Silt and sand           | 20   | 0.26  | 12350  | 3600                     | 7200             | 23100       | 80 x 290    | 120-140                         | 80             |
| Silt                    | 30   | 0.19  | 22300  | 4200                     | 9300             | 35800       | 95 x 380    | 130-150                         | 70             |
| Loam and silt           | 45   | 0.12  | 61500  | 5400                     | 17400            | 84300       | 150 x 562   | 140-160                         | 60             |
| Loam                    | 60   | 0.08  | 164000 | 6500                     | 38200            | 208700      | 220 x 946   | 170-190                         | 50             |
| Clay and silt           | 90   | 0.04  |        |                          |                  |             |             |                                 |                |
| Clay                    | 120  | 0.02  |        |                          |                  | •           |             |                                 |                |

$$G = (4000 + \frac{A}{5\%}) \frac{F}{160}$$
 See Table 4  

$$D = 1500 \frac{g}{S}$$
 See Table 5  

$$B = 2000 + \frac{G+D}{2.5}$$
 or  $4000 + \frac{G+D}{5}$  See Table

7

—To be constructed: an aerobic evapotranspiration bed, 18" deep (partly imported sand) with waterproof side beams, with grass and shrubbery planted above and beside. No soil infiltration is anticipated ( $S_1 = 0$ ).

—The wastewater table is kept 6" to 9" below the grass surface during summer ( $S_e = 0.11$ ) but is permitted to rise to 2" to 3" below the surface during winter ( $S_e = 0.08$ ); thus the average  $S = S_1 + S_e = 0.1$  gal/sq.ft./day.

Lot Area Calculated:

-Lot area = B + G + D in square feet. Well protection area does not need to be considered, since no soil infiltration is anticipated and no wells will be built.

Fig. 17. Comparison of lot sizes.

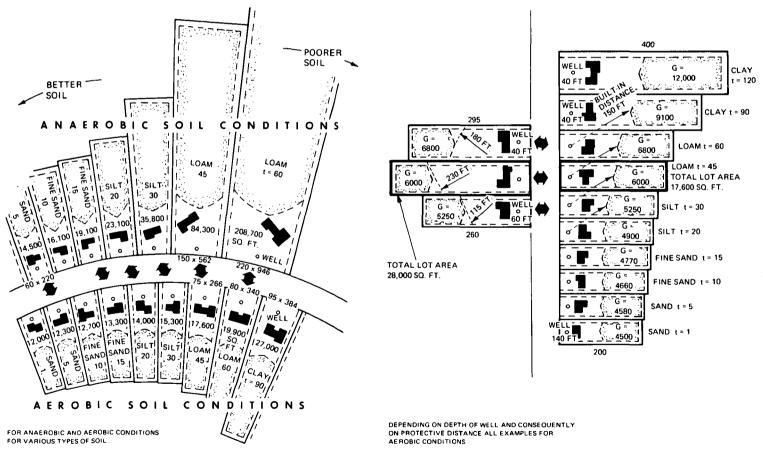


Fig. 16. Comparison of lot sizes.

100 0

- Anon C. /F

A 11

$$G = (4000 + \frac{A}{S^{3/2}}) \times \frac{F}{160}$$

$$A = \frac{F \cdot L}{S} = \frac{160 \times 1.0}{0.1} = 1600 \text{ sq. ft.}$$

$$G = (4000 + \frac{1600}{0.1 \times 0.33}) \times 1.0 = 53,000 \text{ sq. ft.}$$

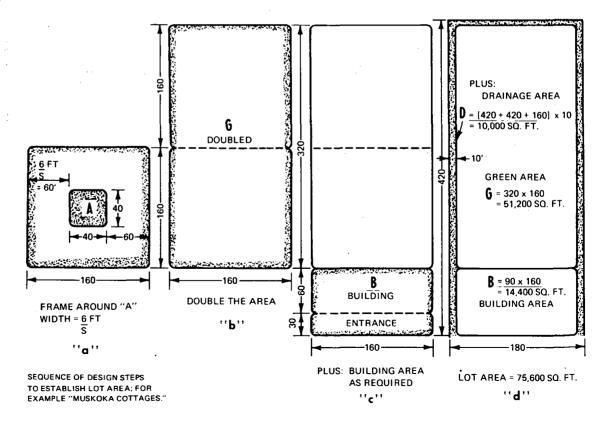
$$-Drainage Area D: (g = 1, S = 0.1)$$

$$D = 1500 \times \frac{g}{S} = 15,000 \text{ sq. ft.}$$

$$-Building Area B:$$

$$B = 4000 + \frac{G + D}{5} = 4000 + \frac{68,000}{5} = 17,600 \text{ sq. ft.}$$
(or B from table = 12,000 sq. ft.)  
-Lot area = 53,000 + 15,000 + 17,600 = 85,600 sq. ft.  
Lot Area Designed: (Figure 18)

—Seepage area A calculated:  $A = \frac{F \cdot L}{S} = 1600 \text{ sq. ft.}$ 



ft.

Fig. 18. Sequence of design steps.

—Frame around A with a width of  $\frac{6 \text{ ft.}}{\text{S}} = \frac{6}{0.1} = 60 \text{ ft.}$ 

—Double above area for G = 2 (160  $\times$  160) = 51,200 sq. ft.

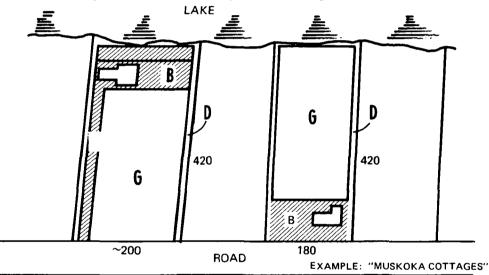
—Design a building area 60 ft. deep and a building entrance area 30 ft. deep: B = 14,400 sq. ft.

—Design a 10 ft. wide "frame" around the lot for storm water swales 10 ft.  $\times$  1000 ft. = 10,000 sq. ft.

-The total lot area is 51,200 + 14,400 + 10,000 = 75,600 sq. ft.

-Therefore, a detail design for each lot often leads to smaller lot areas, and pays off where land is expensive.

Possibilities for lot layout and location of buildings are shown in Figure 19.



#### Conclusion

The presented method of lot size calculations should make it possible to design subdivisions for single family houses which employ the best possible disposal of the wastewater, namely to return it to plant life and into soil, from where the water originally came. The proposed area calculations, together with improved methods of wastewater treatment, as well as the application of filtration and evapotranspiration phenomena, assure that sufficient area is available on each lot for wastewater disposal, stormwater disposal and protection of the water supply, in addition to the spaces needed for the major living activities.

Difficulties and failures, which have discredited individual wastewater units and water supply systems in the past, will be avoided in the future if the methods described here are used. They may also contribute to improvement of our much abused environment.

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Agro. Journ. Agronomy Journal

Am. City American City

Am. Journ. Botany American Journal of Botany

Am. Journ. Med. Sci. American Journal of the Medical Sciences

Am. Journ. Pub. Health American Journal of Public Health

**Ann. Agron.** Annales Agrononiques

App. Microbiology Applied Microbiology

Bot. Gaz. Botanical Gazette

**Can. Engrg. Journ.** Canadian Engineering Journal

Can. Med. Asso. Journ. Canadian Medical Association Journal

**Can. Muni. Util.** Canadian Municipal Utilities

**Disc. Faraday Soc.** Faraday Society Discussions

#### Gesundheits-Ingenieur

Journ. Am. Water Works Assn. Journal of American Water Works Association Journ. Forestry Journal of Forestry

Journ. Water Poll. Control Fed. Journal. Water Pollution Control Federation

N. E. Journ. Med. New England Journal of Medicine

Physiol. Zoo. Physiological Zoology

Plant Physiol. Plant Physiology

**Proc. Roy. Soc. A** Royal Society. Proceedings. Series A: Mathematical and Physical Sciences

# **Public Works**

Sci. Agriculture Scientific Agriculture

Sewage and Ind. Wastes Sewage and Industrial Wastes Journal

Soil Sci. Soil Science

Soil Sci. Soc. Am. Proc. Soil Science Society of America. Proceedings

Trans. Am. Geophys. Union Transactions. American Geophysical Union

Trans. Am. Soc. Civil Engrs. Transactions. American Society of Civil Engineers

Water and Sewage Works

# Performance Standards and the National Sanitation Foundation

#### Introduction

While the most frequently quoted engineering guide to septic tank system design is the U.S. Public Health Service's *Manual of Septic Tank Practice*, most states and local jurisdictions have their own specifications regarding a variety of water supply and wastewater treatment systems. Because the specifications for all equipment vary so widely among jurisdictions and are so frequently subject to change, they are not included here. The same variability holds for zoning practices, lot sizing (an approach is presented in Appendix A), critical separation distances between treatment works and structures, and so forth. To obtain the latest engineering specifications for the type of installation anticipated, contact responsible agencies in the area of interest.

Engineering standards for wastewater treatment equipment and materials have been published by a variety of agencies. Performance standards, which are concerned with how a unit is expected to perform in a realistic operating environment rather than specific engineering design, have been established for individual aerobic wastewater treatment plants and other processes and devices by the National Sanitation Foundation. The following is a description of the NSF program in Wastewater Technology prepared by Heinz B. Russelmann, P.E., Director, Wastewater Technology, National Sanitation Foundation.

# Wastewater Technology Program at the National Sanitation Foundation

The National Sanitation Foundation at Ann Arbor, Michigan, is a not-for-profit organization dedicated to the solution of problems for an improved environment. Areas of concern include drinking water supply, liquid waste disposal, solid waste handling, swimming pool equipment, restaurant equipment, etc., represented by thousands of products manufactured by industries in the United States, Canada, Europe and Asia.

The purpose of the Foundation is to gain consensus among manufacturers, governmental regulatory officials and the users of products in defining necessary standards of construction and criteria for performance. In this way, designers and manufacturers of processes and devices may be guided to use sound practices of sanitation, regulatory officials may have a rational basis for decision-making in the acceptance of products, and users may have reasonable assurance that public health principles have been employed.

The National Sanitation Foundation Testing Laboratory, Inc. tests products according to published standards and criteria and may authorize the issuance of the NSF Seal in recognition of conform-

#### National Sanitation Foundation

129

ance with the standards. Published listings identify the conforming products and periodic inspections of manufacturing processes validate their continuing conformance.

In matters of wastewater treatment, the National Sanitation Foundation provides the following services:

1. Testing of small sewage treatment plants which have been prefabricated and factory assembled. Such plants, generally having capacities from 2,000 gallons per day, are intended to serve small communities, schools, shopping centers, institutions and commercial or industrial facilities. They provide compact and economical means for wastewater treatment especially in small areas of population concentration or rural settings where treatment must be provided centrally and until regional systems can be justified. They can provide phased increases of capacity on a modular basis as population or development increases. The Foundation has developed a Standard Performance Evaluation Method by which a package-type plant may be tested. Upon completion of the 100-day operating schedule, a report of performance is issued to demonstrate the capability of the plant under the specified test conditions. The test data are available for review by designing engineers and regulatory officials in their consideration of a particular plant to meet a local sewage treatment need. Those manufacturers who have submitted plants for testing, for which data are available, are identified in a published list. Testing is done at the Ann Arbor research site.

2. Testing of small plants intended for installation on individual home-sites. NSF Standard No. 40 for Individual Aerobic Wastewater Treatment Plants was conceived by representatives of industry, public health agencies and a variety of governmental agencies and professional groups. It does not attempt to define design requirements except in the very general sense of compatibility with the use environment, operation and maintenance, repairability, serviceability and safety. A plant must demonstrate that, on the basis of 90 per cent probability during the six-month test period, effluent quality shall not exceed one of two classifications: 20 milligrams per liter BOD<sub>5</sub> and 40 milligrams per liter suspended solids for the higher quality discharge; 60 milligrams per liter BOD<sub>5</sub> and 100 milligrams per liter suspended solids for the manufacturer or the distributor to assure proper installation and a service program for inspection and maintenance. A recommended one year warranty is included.

Plants have been submitted by manufacturers and have undergone tests at the Ann Arbor research site for conformance with the standard. Those bearing the NSF Seal have demonstrated that the required effluent quality has been produced under the defined test conditions. Those manufacturers whose plants meet the requirements of the standard are listed by the Foundation.

3. Performance evaluations of special processes or devices under the provisions of NSF Basic Criteria C-9. Special test protocols are developed to measure the performance of the plant against the manufacturer's claims and sound principles of sanitary engineering practice. Upon testing, the Foundation reports on performance and may identify compliance with the requirements through the issuance of the NSF Seal.

Figures 24 through 27 illustrate several aspects of the NSF wastewater treatment plant testing program.

Fig. 24. Main sewage sampling manifold (upper left to lower right) and programmable sampling station (upper center).

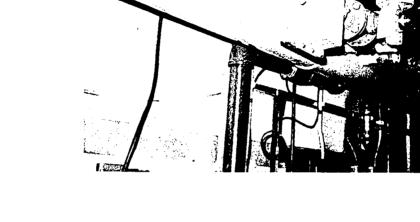




Fig. 25. Several individual home aerobic wastewater treatment plants undergoing performance testing.

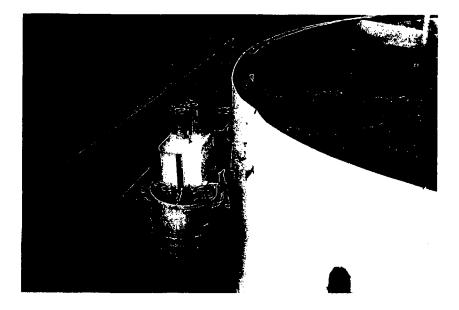


Fig. 27. Wastewater test evaluation laboratory.



# Survey of Available Equipment and Equipment Data Sheets

#### Introduction

The summary information included here on representative selections of sewage treatment equipment applicable to rural communities is organized along functional lines — waste-water conveyance, treatment, disposal, and so forth. Emphasis in the selection reflects the relative importance to rural areas of the particular classes of equipment. Most of the information-collection effort was directed at individual home (on-site) aerobic treatment units. The second greatest effort was made to obtain information on package treatment plants of subdivision size.

Data were obtained directly from the manufacturers and this Appendix could not have been assembled without the cooperation of the manufacturers represented herein. It is recognized that some products may perform better than others. Until all the units are evaluated objectively under standardized conditions, however, meaningful performance comparisons will be impossible. The information which appears on the summary data sheets is, therefore, as it was furnished by the manufacturers. The non-availability of comparative data places the burden of selectivity upon the designer.

Manufacturer-contact information has been supplied on every summary data sheet. The data sheets are provided as a guide to what is available on the market, and, perhaps, for preliminary system design purposes. Readers are advised in each case to contact the manufacturer for latest specifications and pricing information.

## Self-Contained Systems

# Self-Contained Systems

Multrum, 134 Andstor International Destroilet, 136 Lamere Industries, Inc.

# Introduction

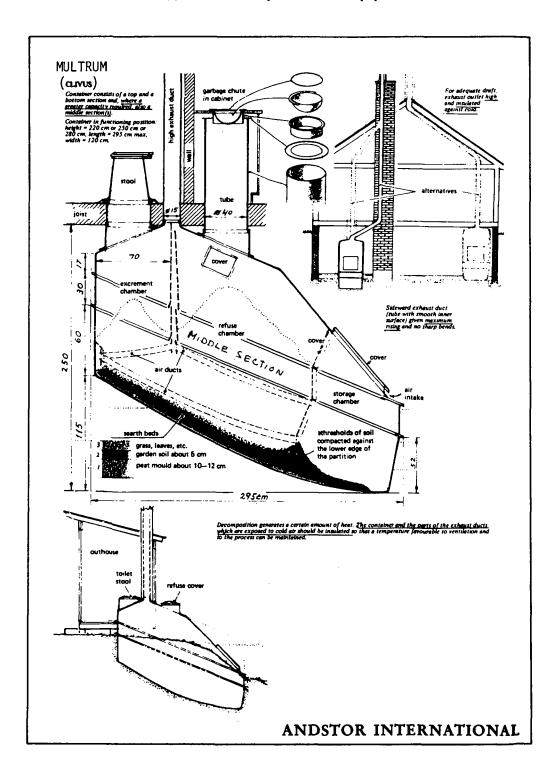
In almost any rural community there are likely to be at least a few homes that cannot be served by the more common on-site disposal systems or sewer lines at reasonable cost — an isolated house high up on a steep rocky hill or a few houses on a small island with a very high water table, for example. In such instances, systems for completely treating or containing toilet wastes (sanitary wastes) so that no treatment load is placed on the immediately surrounding environment should be considered. If water carriage of wastes is desired, a holding tank can be installed. The tank would need to be pumped out periodically and its contents disposed in a sewage treatment facility. With the holding tank arrangement, the pumping truck essentially takes the place of the sewer as the means of conveying wastes to the treatment plant.

If water carriage of wastes is not a necessity, privies may be employed. Privy design information may be found in works by Salvato [12] and Wagner and Lanoix. [11] Privies may be designed for infiltration of decomposed waste materials into the soil or as water-tight vaults which are pumped as holding tanks are pumped.

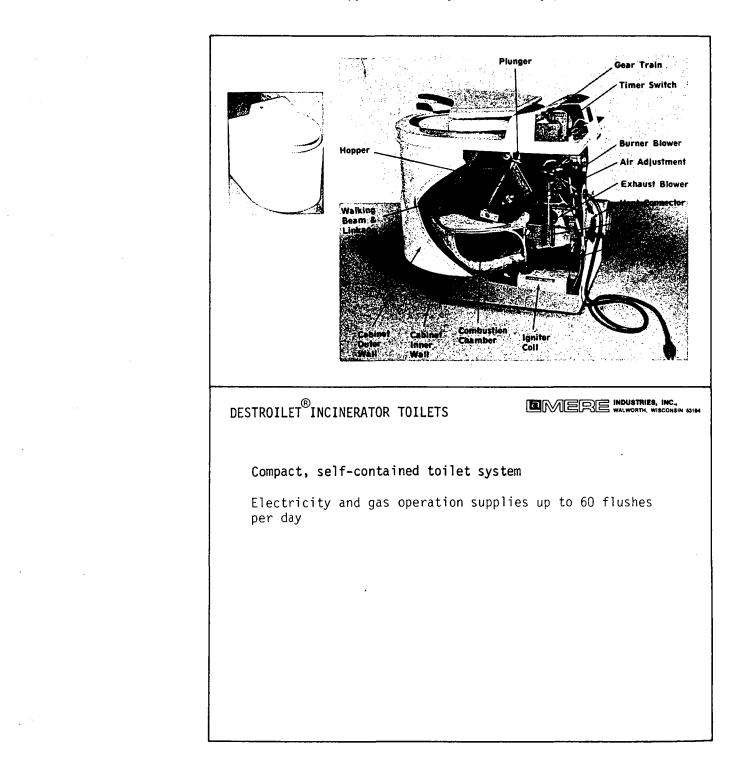
A prefabricated version of a privy system which utilizes aerobic composting of solid wastes from kitchen and toilet is shown in this section. Aerobic composting is ensured by a system of airducts and draft tubes. The unit is manufactured abroad, but growing interest among conservation groups in the U.S. has led the manufacturer to seek U.S. licenses to manufacture and/or distribute the system. The compost which is taken from the system is reportedly suitable for use as garden fertilizer or soil conditioner. The unit has been engineered to permit either household installation or installation in an outdoor privy.

An incinerator toilet is also included here. This particular unit is available for operation with either natural gas or propane gas. An electric incinerator toilet is reportedly available from another manufacturer, but the authors were unable to obtain information from the manufacturer.

Incinerator toilets reportedly operate for about \$2.00 per month fuel costs for a family of three. [37] Operating skills are minimal, as the incineration cycle is either automatically actuated when the seat cover is closed, or the cycle is initiated by setting a timer dial. Some minor odors are generated during the incineration, but these are only apparent when atmospheric conditions cause down-drafting into the house.



|                                                                            | 171 21<br>EL. 08/8                                                                               | SOLN/<br>32 00 7                                                                      |                                                                                         | DEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                               | Charge of                                                                              | Licensing                                 |                             |                                                                                                                        |                                                                                                   | DOMEST                                                                                        |                                                                                        | TER-COMPOS                                                                                              | TER                          |
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| MODEL                                                                            |                                                                                                                             |                                                                                     | NS                                                                                        | WEIGHT                                                                              | RATED                                                                                               | TANK                                                                                     |                                                                                                   | STS (DOL                          |                                                            | DESIGN                                        |                                                              | UIREMENTE                                  | OPERATING                                       |               |
| NUMBER<br>(MAJOR)                                                                | LENGTH                                                                                                                      | WIDTH                                                                               | HEIGHT                                                                                    |                                                                                     | CAPACITY<br>(GPD)                                                                                   | CAPACITY<br>(GAL.)                                                                       | SUGG, LIST<br>(FOB ]<br>FACTORY)                                                                  | INSTAL<br>COST                    |                                                            | LIFETIME<br>{YRS.I                            | ELECTRICITY<br>(RATING)                                      | OTHER 2                                    | SUPPLIES                                        |               |
| 54P5B<br>54N5B                                                                   | 21 <u>3</u> "                                                                                                               | 16"                                                                                 | 20"                                                                                       | 95 <sup>3</sup>                                                                     | up to 60<br>flush/da                                                                                |                                                                                          | 395.00                                                                                            | 75.00                             | 0 (See<br>below)                                           | 12 years                                      | 115 V AC<br>300 W<br>60.Hz                                   | Gas -<br>25,000<br>BTU/hr                  | 1/5 1b.<br>propane 4<br>per flush               |               |
| 54P9B<br>54N9B                                                                   | •                                                                                                                           | - I                                                                                 |                                                                                           |                                                                                     | 'n                                                                                                  |                                                                                          | "                                                                                                 |                                   |                                                            |                                               | 220 V AC<br>300 W<br>50-50 Hz                                |                                            |                                                 |               |
| 54P2B<br>54N2B                                                                   |                                                                                                                             |                                                                                     |                                                                                           |                                                                                     | "                                                                                                   |                                                                                          | "                                                                                                 | -                                 | в.                                                         |                                               | 12 V DC<br>at<br>50 anp                                      |                                            |                                                 |               |
| <sup>7</sup> FOB, Wa<br><sup>3</sup> 105 16.                                     |                                                                                                                             |                                                                                     |                                                                                           | Gasi                                                                                | 6" W.C. 1                                                                                           | natural or                                                                               | - 11" W. (                                                                                        | . LP; 0                           | operating pr<br>11" W.C. LP                                | essure: 3                                     | 1/2" W.C. na                                                 | tural <sup>4</sup> Pr                      | oportionate v<br>tural gas/flu                  |               |
| cos                                                                              | its.                                                                                                                        |                                                                                     |                                                                                           |                                                                                     |                                                                                                     | of flue                                                                                  | d servicin<br>line.                                                                               |                                   | 2. Cleanin<br>clean w<br>3. Automot                        | g: vacuum<br>ater.<br>ive spark               | ashes, clear<br>plug used, re<br>g diagram for               | n bowl and i<br>eplaceable.                | d be cleaned<br>ncinerate wit<br>gnosis.        | h 8 oz.       |
| MODEL<br>NUMBER                                                                  | (R - S                                                                                                                      |                                                                                     | RFORMAN                                                                                   |                                                                                     |                                                                                                     | OPERATI                                                                                  |                                                                                                   | IOISE<br>&                        | STANDARDS                                                  |                                               |                                                              |                                            |                                                 |               |
| (MAJOR)<br>54P58                                                                 | 800 <sub>5</sub>                                                                                                            |                                                                                     | <b>DO</b> CO                                                                              |                                                                                     |                                                                                                     | (TEMP, OTH                                                                               | Hind                                                                                              | oons 5<br>or out-                 | CODES MET                                                  |                                               |                                                              |                                            |                                                 |               |
| 54N5B<br>54P9B                                                                   | NA                                                                                                                          | NA .                                                                                | NA 1                                                                                      | NA                                                                                  |                                                                                                     | Unlimite<br>                                                                             |                                                                                                   | odors                             | NSF and CGA                                                | ·                                             |                                                              |                                            |                                                 |               |
| 54N9B<br>54P2B<br>54N2B                                                          |                                                                                                                             | -                                                                                   |                                                                                           |                                                                                     |                                                                                                     |                                                                                          |                                                                                                   |                                   |                                                            |                                               |                                                              |                                            |                                                 |               |
| 54120                                                                            |                                                                                                                             |                                                                                     | _                                                                                         |                                                                                     |                                                                                                     |                                                                                          |                                                                                                   |                                   |                                                            |                                               |                                                              |                                            |                                                 |               |
| When un                                                                          | it is u                                                                                                                     | used wh                                                                             | ile comi                                                                                  | bustion<br>usebold                                                                  | chamber i                                                                                           | is hot, f                                                                                | lue carrie                                                                                        | s odors                           | s until burn                                               | ing cycle                                     | continues.                                                   |                                            |                                                 |               |
| -ADD/1es                                                                         |                                                                                                                             |                                                                                     |                                                                                           |                                                                                     |                                                                                                     |                                                                                          |                                                                                                   |                                   |                                                            |                                               |                                                              |                                            |                                                 |               |
| app<br>2.1 y<br>on s                                                             | NTIES.G<br>electi<br>proved.<br>r. guar<br>combust                                                                          | SUARA<br>rical,<br>antee (                                                          | NTEES,<br>gas, and<br>on overa                                                            | & SERV<br>d safety<br>11 qual<br>free of                                            | ICE<br>component<br>ity and 5<br>defects i                                                          | in materia                                                                               | 1                                                                                                 | ľ                                 | I. Destroi<br>NSF Sea                                      | let Model                                     | ANCE<br>5 conforms to                                        | > NSF Standa                               | rd No. 24, is                                   | sued          |
| WARRAN<br>1. All<br>app<br>2. 1 y<br>on<br>and<br>cha<br>3. Any<br>and<br>4. Qua | NTIES.G<br>election<br>roved.<br>r. guar<br>combust<br>workma<br>rges on<br>LP gas<br>materi<br>lified                      | antee (<br>ion chi<br>inship)<br>repair<br>compair<br>al rational                   | NTEES,<br>gas, and<br>on overa<br>amber (1<br>; does r                                    | & SERV<br>d safety<br>free of<br>not incl<br>service<br>lation r                    | ICE<br>component<br>ity and 5<br>defects f<br>ude labor<br>and inst                                 | i yrs.<br>in materia<br>and ship<br>call at lo                                           | il<br>ping                                                                                        |                                   | 1. Destroi<br>NSF Sea<br>COMMENTS<br>1. Additio<br>4" dia. | <pre>let Model l. nal instal , 2' above</pre> | 5 conforms to<br>ACCURA<br>lation requi                      | ATE AS OF _<br>rements for<br>nimum height | July 31, 1972<br>vertical vent<br>; flue joints | <del></del> ; |

### Appendix C: Survey of Available Equipment

# Wastewater Collection and Conveyance Subsystems

Air Vac—Vacuum Sewage System, 140 Air Vac/Division of National Homes Construction Corp.

Tex-Vit—Prefabricated Pump Stations, 142 Cantex Industries

Flygt Pumps—Sewage Lift Pumps, 144 Flygt Corporation

Tulsa Unit—Pressurized Sewer System, 146 H & B Industries, Inc.

Hydr-O-Grind—Sewage Grinder Pump Systems, 148 Hydromatic Pump Co.

Multi-Flo Pumps—Submersible Sewage Pumps, 150

Multi-Flo, Inc.

# Introduction

In addition to conventional sewers, combinations of pressure or vacuum pumps and small diameter mains can be assembled to move sewage from the home under pressure (positive or negative) to the treatment plant. This section includes a variety of pressure pumps and pump stations. As indicated, some are intended primarily for pressure sewer systems.

Wastewater from which settleable solids have been removed can be moved with a smaller pump than raw sewage. A composite system which employs interceptor tanks (similar to septic tanks) and small pumps was described in Chapter Four. A pump for individual house use for pressurized effluent systems (which are fed by septic or aerobic tanks) is described in this section.

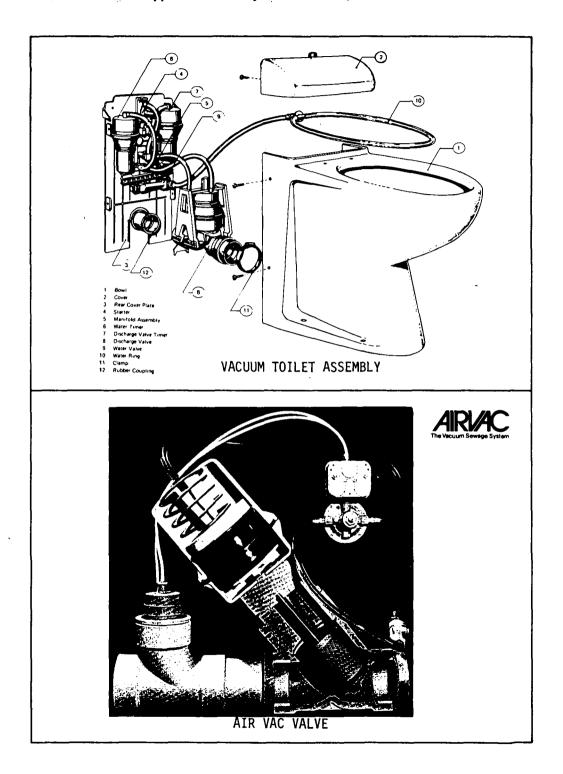
Pumps with integral grinders or macerators which reduce solids to small sizes and pump the comminuted raw sewage under pressure are also shown.

In addition, a vacuum sewer system is briefly described. Because of special design requirements for vacuum systems, the manufacturer prefers to custom design and market an entire collection and conveyance system rather than individual components.

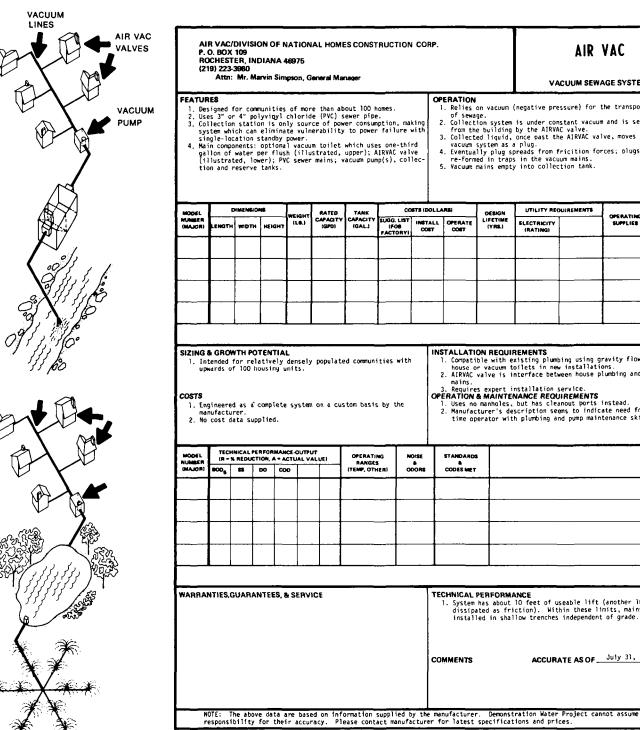
The use of small diameter mains through which sewage is moved under positive pressure or vacuum offers special advantages over gravity mains. The pressure mains can be laid independent of grade within the head limitations of the pumping systems; trenches need be just deep enough to be below the frost line, thus reducing excavation costs; small diameter plastic pipe can accommodate bends more readily than conventional sewer lines, thus they can conform more easily to terrain features or curving layouts of subdivision lots. There are, of course, cost tradeoffs between savings on mains and other first costs and continuing maintenance requirements and replacement costs for pumping stations associated with pressure sewers. Such tradeoffs should be factored into the choice of a system.

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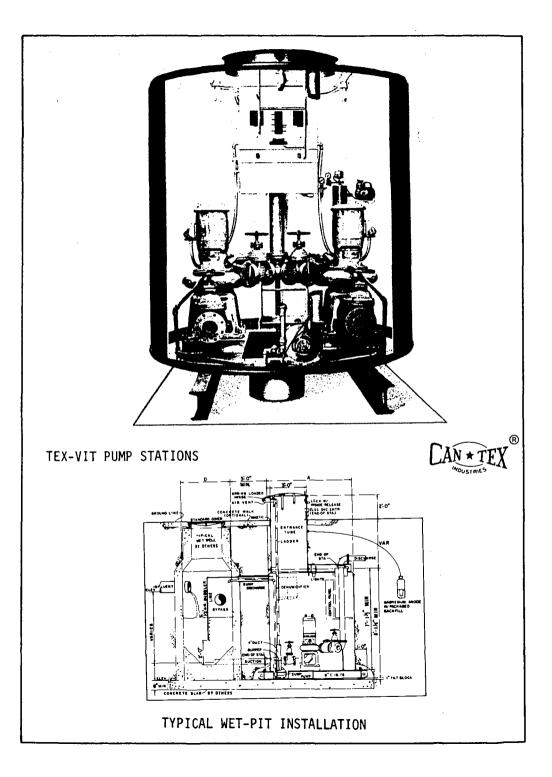


| Ma                        | nager                                                                                  |                                    |                    |      |                                                                                                                             |                                                                                                           | VA                                                                                                            | CUUM SEW                                                                               | AGE SYSTEM                                                       |                   |
|---------------------------|----------------------------------------------------------------------------------------|------------------------------------|--------------------|------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------|
| ) s<br>pow<br>lity<br>let | out 100 h<br>ewer pipe<br>er consum<br>to power<br>which use<br>upper); A<br>acuum pum | ption,<br>failu<br>s one-<br>IRVAC | third<br>valve     | 1 2  | of sewa<br>Collect<br>from th<br>Collect<br>vacuum<br>L Eventua<br>re-form                                                  | on vacuum H<br>ge.<br>ion system<br>e building<br>ed liquid,<br>system as a<br>lly plug sp<br>ed in traps | is under cor<br>by the AIRVA<br>once past the<br>plug.                                                        | istant vacuum<br>C valve.<br>Ne AIRVAC val<br>Pricition for<br>Num mains.              | the transport<br>m and is sepa<br>lve, moves th<br>rces; plugs a | rated<br>rough    |
| 0                         | TANK                                                                                   |                                    | COSTS              | DOLL |                                                                                                                             |                                                                                                           | UTILITY REC                                                                                                   | NUREMENTS                                                                              |                                                                  |                   |
| ED<br>XTV<br>D)           |                                                                                        | SUGG. 1<br>(FOI<br>FACTO           |                    | TALL | OPERATE                                                                                                                     | DESIGN<br>LIFETIME<br>(YRL)                                                                               | ELECTRICITY<br>(RATING)                                                                                       |                                                                                        | OPERATING<br>SUPPLIES                                            |                   |
|                           | d communi                                                                              |                                    |                    | OP   | <ol> <li>Compati<br/>house of<br/>AIRVAC<br/>mains.</li> <li>Require<br/>ERATION</li> <li>Uses no<br/>2. Manufac</li> </ol> | r vacuum ti<br>valve is i<br>s expert i<br><b>&amp; MAINTEI</b><br>manholes,<br>turer's de                | xisting plum<br>oilets in new<br>nterface betw<br>nstallation :<br>NANCE REON<br>but has cle<br>scription sev | w installation<br>ween house p<br>service.<br>MIREMENTS<br>anout ports<br>ems to indic | lumbing and v                                                    | vacuum<br>a fu]l- |
| _                         | OPERATIN<br>RANGES<br>(TEMP, OTH                                                       |                                    | NOISE<br>&<br>ODOR |      | STANDARDS<br>&<br>CODES MET                                                                                                 |                                                                                                           |                                                                                                               |                                                                                        |                                                                  |                   |
| I                         |                                                                                        |                                    |                    |      |                                                                                                                             |                                                                                                           |                                                                                                               |                                                                                        |                                                                  |                   |
| T                         |                                                                                        |                                    |                    |      |                                                                                                                             |                                                                                                           |                                                                                                               |                                                                                        |                                                                  |                   |
| 1                         |                                                                                        |                                    |                    |      |                                                                                                                             | 1                                                                                                         |                                                                                                               |                                                                                        |                                                                  |                   |
| ╉                         |                                                                                        | †                                  |                    | ╈    |                                                                                                                             |                                                                                                           |                                                                                                               |                                                                                        |                                                                  |                   |
| 1                         |                                                                                        | I                                  |                    |      |                                                                                                                             |                                                                                                           |                                                                                                               |                                                                                        |                                                                  |                   |
|                           |                                                                                        |                                    |                    | TE   | <ol> <li>System<br/>dissipa</li> </ol>                                                                                      | ated as fri                                                                                               | 10 feet of u                                                                                                  | hin these li                                                                           | (another 10<br>mits, mains<br>; of grade.                        | feet<br>can be    |

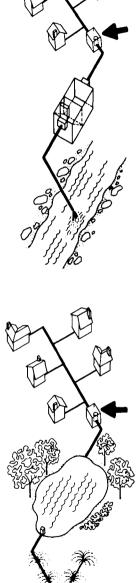
COMMENTS

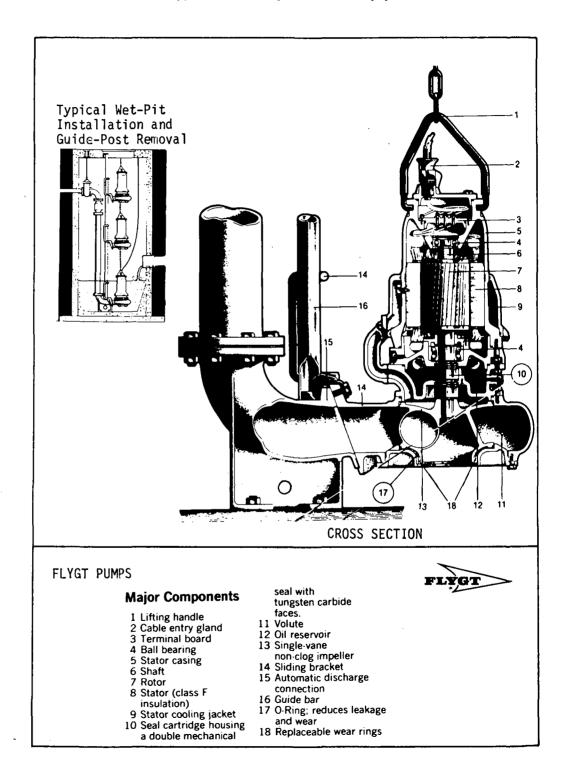
ACCURATE AS OF \_\_\_\_\_July 31, 1972

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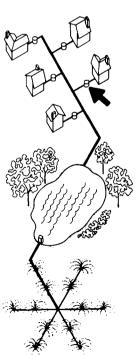


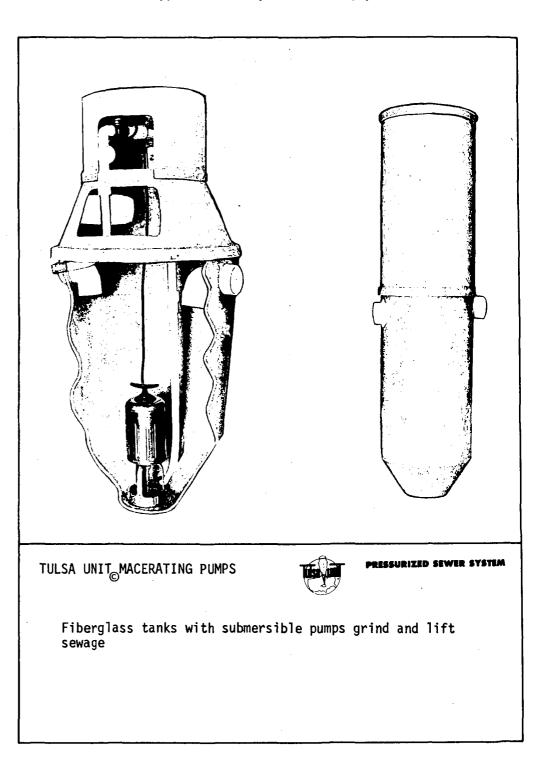
CANTEX INDUSTRIES TEX-VIT P. O. BOX 340 MINERAL WELLS, TEXAS 76067 (817) 325-3344 Attn: Mr. Ralph F. Conte, Vice-President, Process Equipment Division PRE-FABRICATED PUMP STATIONS FFATURES OPERATION Pre-fabricated steel lift stations can be unit-installed with self-contained systems for sewage pumping applications.
 Two or three vertical pump styles, sump pump, dehimingifier, entrance tube, control panel, attractive interior.
 Corrosion resistent, magnesium anodes.
 4, 4", 6" or 8" pipe sizes. 1. Influent collects in wet well, is sucked in at V-bottom to lift station. Pumps which are piped to the wet well lift sewage to higher elevation for further conveyance or treatment. DIMENSION COSTS (DOLLARS) UTILITY REQUIREMENTS RATED TANK RODEL OPERATING PIPE LINE F APACIT CAPACITY 100 1157 (LB.) INSTALL OPERATE ELECTRICITY SUPPLIES SIZE IMA SORS (FOB ENGTH MOTH HEIGHT (GPD) GAL. (YRS.) COST COLL (RATING) 8'14 Standard 4" or 4" Fram (ຫຼຸ່ມເຫມສ) NA 20 Influent 2 pumps Ratings 6" 2 pumps round (min. 4", 6" or 8" 4" Fram ... ... .... 3 pumps 3 pumps <sup>1</sup>Does not include entrance tube (varies). SIZING & GROWTH POTENTIAL INSTALLATION REQUIREMENTS 1. 6" frame, 3 pump style with 10" piping available in Tex-Vit Excavation and concrete pad with 1" tilt block required.
 Plumbing, electrical, crane operation skills required.
 Wet well (by others) should proceede pump station. models. 2. "Tex-Quad" systems for larger demands. 3. Modifications for wet pit pumping possible. COSTS **OPERATION & MAINTENANCE REQUIREMENTS**  Qualified operator required for regular maintenance.
 Automatic control system for unattended operation. TECHNICAL PERFORMANCE OUTPUT (R - % REDUCTION, A - ACTUAL VALUE) MODEL NUMBER OPERATING STANDARDS NOISE RANGES a OCORS CODES MET MANDR 100<sub>6</sub> 53 00 COD TEMP, OTHER WARRANTIES, GUARANTEES, & SERVICE 1. 1 year from date of acceptance or 18 months from date of ship-ment warranty on parts and workranship. Repaired or replaced TECHNICAL PERFORMANCE free of charge. Replacement parts and service available from factory. Factory service invoiced at \$100/day (labor).
 Cantex provides start-up serviceman free; operator training available. COMMENTS DMMENTS ACCURATE AS OF July 31, 1972 1. Additional information on costs, technical performance available from manufacturer. NOTE: The above data are based on information supplied by the nanufacturer. Demonstration Water Project cannot assume responsibility for their accuracy. Please contact manufacturer for latest specifications and prices.



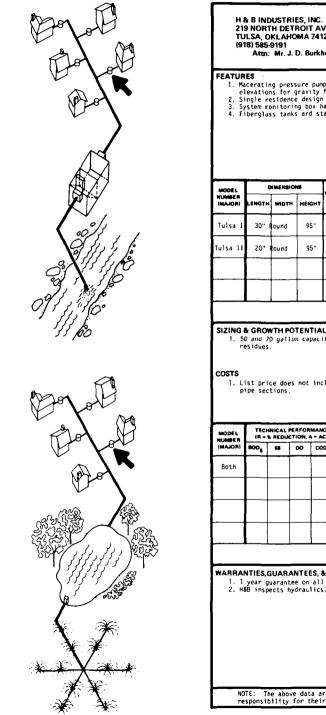


| FEATU                                                                                                           | RE8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| CG 3065                                                                                                         | 19 <mark>1</mark>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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| CP 3082                                                                                                         | 12"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| 1. C<br>2. R<br>COSTS<br>1. B                                                                                   | is ho<br>icture)<br>inge of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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Electric<br>installa<br>PERATION :<br>1. Operatic                                                                                   | on to disc<br>collection<br>al and sev<br>tion.<br>& MAINTE                                                       | REMENTS<br>tharge with p<br>on and pumpin<br>wage pump eng<br>NANCE REQU<br>utomatically                       | ig.<br>lineering sk<br>JIREMENTS                            | ills neede                            |
| 1. C<br>2. R<br>COSTS<br>1. B<br>e<br>t                                                                         | is is ho<br>icture)<br>inge of<br>ise pri<br>iectric<br>rols, p                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | rizont<br>mounts<br>units<br>ce inc<br>cable<br>iping                                                        | ally mou<br>ed unit.<br>: 3"-14<br>ludes pu<br>. Contr<br>and valv                              | AL<br>nted uni<br>" discha<br>mp disch<br>ol panel<br>ing are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | it and CP<br>arge line;<br>harge conn<br>s, access<br>extra cos                                         | is vertic<br>2.0 HP-8<br>ection, c<br>frames,<br>t options                                                                                    | ally (as<br>8 HP.<br>hain and<br>level cor                      | in Of                                                                                                                                                                                 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            | on to disc<br>collection<br>al and sevicion.<br>B MAINTE<br>B MAINTE<br>an works au<br>nual inspecto<br>ground of | charge with p<br>on and pumpin<br>wage pump eng                                                                | g.<br>ineering sk<br>JIREMENTS<br>by level se<br>by experie | ills needs                            |
| 1. C<br>2. R<br>COSTS<br>1. B<br>e                                                                              | is is ho<br>icture)<br>inge of<br>isctric<br>rols, p                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | rizont<br>mount<br>units<br>ce inc<br>cable<br>iping                                                         | ally mou<br>ed unit.<br>: 3"-14<br>ludes pu<br>. Contr<br>and valv                              | AL<br>nted uni<br>" discha<br>mp disch<br>ol panel<br>ing are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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<li>Semi-ann</li> </ol> | on to disc<br>collectio<br>al and sev<br>ition.<br>Be MAINTE<br>on works an<br>nual inspec-<br>to ground of       | charge with p<br>on and pumpin<br>wage pump eng<br>NANCE REQU<br>utomatically<br>ction of pump                 | g.<br>ineering sk<br>JIREMENTS<br>by level se<br>by experie | ills needs                            |
| 1. C<br>p<br>2. R<br>COSTS<br>1. B<br>e<br>t                                                                    | is is ho<br>icture)<br>inge of<br>ise pri<br>ectric<br>rols, p                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | rizont.<br>mounts<br>units<br>ce inc<br>cable<br>iping<br>NNICALI                                            | ally mou<br>ed unit.<br>: 3"-14<br>ludes pu<br>. Contr<br>and valv                              | AL<br>nted uni<br>" discha<br>mp disch<br>ol panel<br>ing are<br>NCE-OUTP<br>ACTUAL V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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            | on to disc<br>collectio<br>al and sev<br>ition.<br>Be MAINTE<br>on works an<br>nual inspec-<br>to ground of       | charge with p<br>on and pumpin<br>wage pump eng<br>NANCE REQU<br>utomatically<br>ction of pump                 | g.<br>ineering sk<br>JIREMENTS<br>by level se<br>by experie | ills neede<br>nsors and<br>nced perso |
| 1. C<br>p<br>2. R<br>COSTS<br>1. B<br>e t<br>t<br>MODEL<br>MAMBER<br>(MAJOR)                                    | is is ho<br>icture)<br>inge of<br>isctric<br>rols, p                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | rizont.<br>mounts<br>units<br>ce inc<br>cable<br>iping<br>NNICALI                                            | ally mou<br>ed unit.<br>: 3"-14<br>ludes pu<br>. 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            | on to disc<br>collectio<br>al and sev<br>ition.<br>Be MAINTE<br>on works an<br>nual inspec-<br>to ground of       | charge with p<br>on and pumpin<br>wage pump eng<br>NANCE REQU<br>utomatically<br>ction of pump                 | g.<br>ineering sk<br>JIREMENTS<br>by level se<br>by experie | ills neede<br>nsors and<br>nced perso |
| 1. C<br>p<br>2. R<br>COSTS<br>1. 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Contr<br>and valv                              | AL<br>nted uni<br>" discha<br>mp disch<br>ol panel<br>ing are<br>NCE-OUTP<br>ACTUAL V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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            | on to disc<br>collectio<br>al and sev<br>ition.<br>Be MAINTE<br>on works an<br>nual inspec-<br>to ground of       | charge with p<br>on and pumpin<br>wage pump eng<br>NANCE REQU<br>utomatically<br>ction of pump                 | g.<br>ineering sk<br>JIREMENTS<br>by level se<br>by experie | ills neede<br>nsors and<br>nced perso |
| 1. C<br>p<br>2. R<br>COSTS<br>1. B<br>e<br>t<br>t<br>MADORL<br>MAJORI<br>Both                                   | is is ho<br>icture)<br>inge of<br>ise pri<br>ictric<br>rols, p<br>recc<br>(a -<br>eco <sub>5</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | rizont:<br>mount<br>units<br>cce inc<br>cable<br>iping<br>ss<br>ss                                           | ally mou<br>ed unit.<br>: 3"-14<br>ludes pu<br>. Contr<br>and valv<br>PERFORMACTION A -<br>DO C | AL<br>ntcd uni<br>" discha<br>mp disch<br>ol pane'<br>ing are<br>NNCE-OUTF<br>ACTUAL V<br>200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | it and CP<br>rrge line;<br>large connu-<br>s, access<br>extra cos<br>vr<br>(ALUE)                       | is vertic<br>2.0 HP-8<br>ection, c<br>frames,<br>t options<br>OPERATI<br>RANGE<br>(TEMP, OTH                                                  | ally (as<br>8 HP.<br>hain and<br>level cor<br>heal (<br>ble noi | in IN of the second sec | 1. Excavati<br>influent<br>2. Electric<br>panela<br>2. Semi-ann<br>1ifted t<br>STANDAROR<br>COMES MET                                              | on to disc<br>collecti<br>al and set<br>tion.<br>& MAINTE<br>m works at<br>nual inspector<br>ground (             | charge with p<br>on and pumpin<br>age pump eng<br>NANCE REQU<br>Litonatically<br>ction of pump<br>elevation by | g.<br>ineering sk<br>JIREMENTS<br>by level se<br>by experie | ills neede<br>nsors and<br>nced perso |
| 1. C<br>2. R<br>COSTS<br>1. B<br>e<br>t<br>t<br>WAGER<br>MADORI<br>Both<br>WARRA<br>1. 5<br>5<br>1<br>2. S<br>5 | s is ho<br>is to ho<br>is pri-<br>is | rizont.<br>mount.<br>units<br>ce inc<br>cable<br>cable<br>iping<br>s REDM<br>ES<br>GUAR.<br>for l<br>policie | ANTEES<br>ed warra<br>pear.                                                                     | AL<br>nted unin<br>" dische<br>mp dische<br>ing dische<br>panele<br>ing are<br>unceOutrie<br>actual v<br>actual v | it and CP<br>rrge line;<br>large connu-<br>s, access<br>extra cos<br>vr<br>(ALUE)                       | is vertic<br>2.0 HP-8<br>ection, c<br>frames,<br>t options<br>OPERATI<br>RANGE<br>(TEMP, OT<br>Submersi<br>Submersi<br>workmansh<br>zed, esta | ally (as<br>8 HP.<br>hain and<br>level cor                      | in IN of the second sec | <ol> <li>Excavati<br/>influent</li> <li>Electric<br/>installa</li> <li>PERATION i<br/>panel.</li> <li>Semi-anr<br/>lifted t</li> </ol>             | on to disc<br>collecti<br>al and set<br>tion.<br>& MAINTE<br>m works at<br>nual inspector<br>ground (             | charge with p<br>on and pumpin<br>age pump eng<br>NANCE REQU<br>Litonatically<br>ction of pump<br>elevation by | g.<br>ineering sk<br>JIREMENTS<br>by level se<br>by experie | ills needs                            |

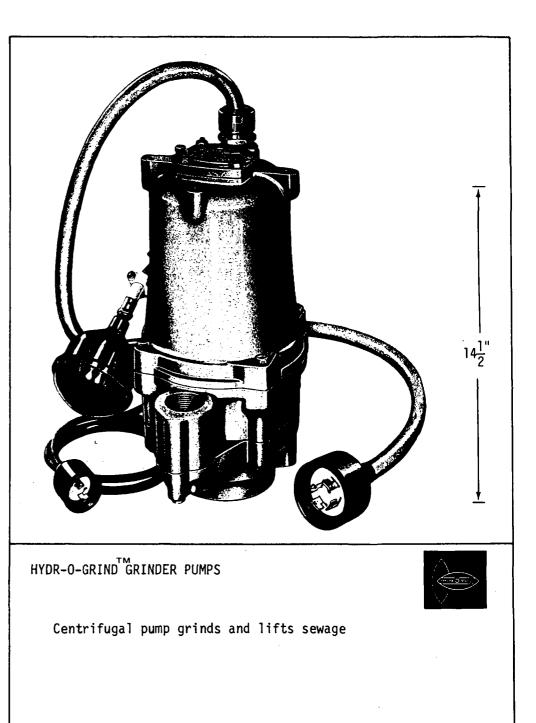




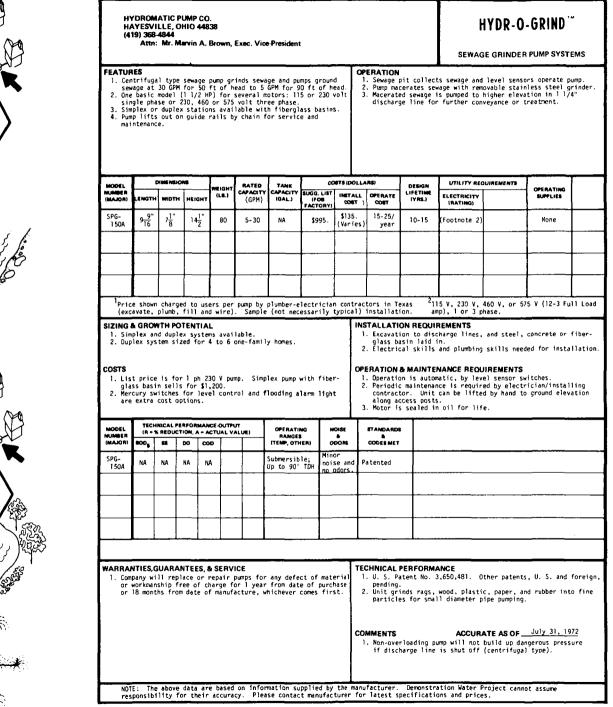
# Appendix C: Survey of Available Equipment

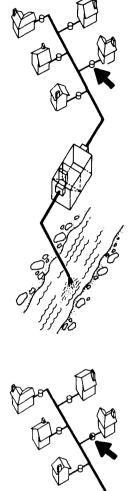


| 219<br>TU                  | 9 NOR1                                                      | H DET                           | ES, INC.<br>ROIT AV<br>MA 741   | /E.                          |                              |                                                      |                   |                                        |                            |                              |                                                           | TULSA                         | UNIT <sup>®</sup>  |        |
|----------------------------|-------------------------------------------------------------|---------------------------------|---------------------------------|------------------------------|------------------------------|------------------------------------------------------|-------------------|----------------------------------------|----------------------------|------------------------------|-----------------------------------------------------------|-------------------------------|--------------------|--------|
|                            | Attn:                                                       | Mr. J.                          | D. Burkl                        | nolder, \                    | /ice-Presid                  | lent                                                 |                   |                                        |                            |                              | PRES                                                      | SURIZED SE                    | WER SYSTE          | м      |
| e1<br>2. Si<br>3. Sy       | ceration<br>levation<br>ingle rootstem model<br>rstem model | ns for e<br>esidence<br>onitori | gravity<br>e design<br>ng box h | flow to<br>capaci<br>as warn | treatmer<br>ty.<br>Ing light | wage to hi<br>it or sewe<br>: installe<br>onstructio | er.<br>Ed in h    | ouse.                                  | treatme                    | cerates wa<br>int tanks o    | stes and lift<br>r sewer.<br>20 min./day c                |                               |                    |        |
|                            |                                                             | HALE NELO                       | 145                             |                              |                              |                                                      |                   | COSTS (DO                              | LLARS                      |                              | UTILITY REC                                               | UIREMENTS                     |                    |        |
| NODEL<br>NUMBER<br>(NAJOR) | LENGTH                                                      |                                 | HEIGHT                          | WEIGHT<br>(LB.)              | RATED<br>CAPACITY<br>(GPD)   | TANK<br>CAPACITY<br>(GAL.)                           | (FOE              | IST INSTA                              |                            | OESIGN<br>LIFETIME<br>(YRS.) | ELECTRICITY<br>(RATING)                                   |                               | OPERATING SUPPLIES |        |
| Tulsa I                    | 30"                                                         | lound                           | 95"                             |                              |                              | 71                                                   | 650.0             |                                        |                            | 40+ 2                        | 230 V AC<br>7.5 amp                                       |                               | None               |        |
| ulsa II                    | 20"                                                         | Round                           | 95"                             |                              |                              | ca 50                                                | 425.0             | 1                                      | 200                        |                              | "                                                         |                               |                    |        |
|                            |                                                             |                                 |                                 |                              |                              |                                                      |                   |                                        |                            |                              |                                                           |                               |                    |        |
|                            |                                                             |                                 |                                 |                              |                              |                                                      |                   |                                        |                            |                              |                                                           |                               |                    |        |
|                            |                                                             |                                 |                                 |                              |                              |                                                      | <sup>1</sup> FOB  | Tulsa, O                               | klahoma.                   | <sup>2</sup> Except          | electric moi                                              |                               |                    |        |
|                            | ipe sec                                                     | tions.                          | not inc                         |                              |                              | cable or                                             | straig            | nt                                     | <ol><li>Spares</li></ol>   | (pump and                    | rmed by sewer<br>motor) for nu<br>00, 3 per 100           | mbers of un                   | its operating      | g:<br> |
| MODEL<br>SUMBER<br>(MAJOR) | (8 - )                                                      | REDUCT                          | ION, A - A                      | CTUAL V                      |                              | OPERATI<br>RANGE                                     | .                 | NOISE                                  | STANDARD                   |                              |                                                           |                               |                    |        |
| Both                       | 800 <sub>6</sub>                                            | 53                              | 00 00                           |                              |                              | Maximum (<br>115 feet                                | of<br>TDH         | ODORS<br>Minor<br>noise an<br>no odors | CODES MET                  | -+                           |                                                           |                               |                    |        |
|                            |                                                             |                                 |                                 |                              |                              |                                                      |                   |                                        |                            | _                            |                                                           |                               |                    |        |
|                            |                                                             |                                 |                                 |                              |                              |                                                      |                   |                                        |                            |                              |                                                           |                               |                    |        |
|                            |                                                             |                                 |                                 |                              |                              |                                                      |                   |                                        | 1                          |                              |                                                           |                               |                    |        |
|                            | year g                                                      | uarante                         | e on all                        | parts,                       | four yea                     | ar pro-ra<br>ctors for                               |                   |                                        | equals<br>2. No cod        | I and II:<br>52 PSI; π       | Pumps 4.8 GP<br>maximum flow i<br>sure systems<br>states. | equals 30 GP<br>, company ha: | M at 16 PSI.       | with   |
| - NO<br>re                 | TE: TP<br>sponsit                                           | e above<br>fility f             | data a<br>or thei               | re base<br>r accur           | d on info<br>acy. Ple        | rmation s<br>ase conta                               | upplied<br>ct man | d by the<br>ifacture                   | manufacturer<br>for latest | . Demonst<br>specificat      | ration Water<br>ions and pric                             | Project canr<br>es.           | not assume         |        |



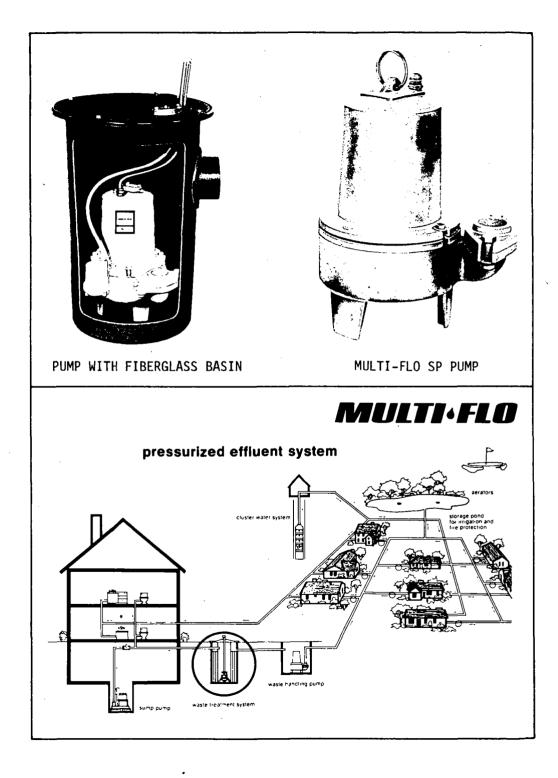
# Appendix C: Survey of Available Equipment

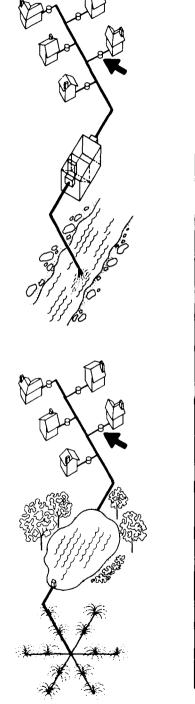






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| (5                                                        | AYTON<br>13) 224                                                                | 7622                                                                               | 45401                                                                       | Krebs. I                                                                             | Exec. Vice-                                                                                                | President                                                           |                                                  |                                             |                                                                                                                        |                                                                                                       |                                                                          | JLII-FLU                                                                  | ) PUMP                                                        | 2                           |
|-----------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|
| 1iq<br>2. Two<br>1/2<br>3. 165<br>4. 2 c<br>5. Mul<br>pic | ES<br>HP or<br>uids an<br>vane<br>HP, u<br>0 or 1<br>or 3" d<br>ti-flo<br>ture) | 1 HP c<br>nd soli<br>impelle<br>p to 14<br>750 RPM<br>ischarg<br>engine<br>for com | ast-iro<br>ds up t<br>r type<br>IO GPM;<br>i single<br>ge; simp<br>gers pre | n and s<br>p 2" in<br>pump li<br>1 HP, u<br>or 3-p<br>lex and<br>ssurize<br>treatmen | tainless s<br>diameter.<br>fts sewage<br>p to 180 C<br>hase opera<br>duplex sy<br>d effluent<br>nt of wast | teel sewa<br>at 5° of<br>pPM.<br>vition.<br>vitem.<br>systems       | head:                                            | lift<br>PRE                                 | <ol> <li>Level s</li> <li>Sewage<br/>or conv</li> <li>SSURIZED</li> <li>Sewage<br/>aerobic</li> <li>Effluen</li> </ol> | placed at<br>ensors tur<br>is pumped<br>eyance.<br>EFFLUENT S<br>from house<br>plants.<br>It is pumpe | bottom of we<br>n pump on and<br>to higher ele                           | t pit where<br>off accord<br>wation for t<br>ties are tree<br>pond for in | ing to flow.<br>further treat<br>ated on-site<br>rigation and | ects.<br>Exment<br>by small |
|                                                           | <b></b>                                                                         | DUMENSI                                                                            |                                                                             | T                                                                                    | <u> </u>                                                                                                   |                                                                     |                                                  | 515 (DOLU                                   |                                                                                                                        | <u> </u>                                                                                              | UTILITY REC                                                              |                                                                           | r                                                             | DISCHG.                     |
| MODEL<br>(UNIDER<br>MAJOR)                                | LENGTH                                                                          | <u> </u>                                                                           |                                                                             | WEIGHT                                                                               | CAPACITY<br>(GPM)                                                                                          | TANK<br>CAPACITY<br>(GAL.)                                          | SUGG. LIST<br>(FOB<br>FACTORY)                   | INSTALL                                     | OPERATE                                                                                                                | DESIGN<br>LIFETIME<br>(YRS.)                                                                          | ELECTRICITY                                                              | PHASE                                                                     | OPERATING<br>SUPPLIES                                         | SIZE<br>NPT                 |
| SP-5                                                      | 14"                                                                             | 122                                                                                | 19"                                                                         | 104                                                                                  | 10-140<br>© 25' -<br>5' ТDH                                                                                | NA                                                                  | 165 -<br>215                                     | Varies                                      | 1/2 HP                                                                                                                 |                                                                                                       | 115,230 VAC<br>230,460 VAC                                               | single ph<br>three ph                                                     | None                                                          | 2" or 3                     |
| SP-10                                                     |                                                                                 |                                                                                    |                                                                             | 107                                                                                  | 10-180<br>0 37'-<br>5' тон                                                                                 |                                                                     | 240 -<br>300                                     | "                                           | 1 HP                                                                                                                   |                                                                                                       | 230 VAC<br>230,460 VAC                                                   | single ph<br>three ph                                                     | "                                                             |                             |
| .evel 1<br>Control                                        | 3 <sup>1</sup> 1"                                                               | round                                                                              | 4 <u>1</u> "                                                                | 4                                                                                    | (on-off)                                                                                                   |                                                                     | 30.75                                            | Negli-<br>gible                             | Negli-<br>gible                                                                                                        |                                                                                                       | <u> </u>                                                                 |                                                                           |                                                               |                             |
| 2. Ten<br>pic                                             |                                                                                 | re home                                                                            |                                                                             |                                                                                      | n pressuri<br>tems – mar                                                                                   |                                                                     |                                                  | OP                                          | 2. Plumbin<br>ERATION<br>1. Motor s<br>2. Occasio<br>on-ring                                                           | g/electric<br>& MAINTE<br>ealed in c<br>nal check-<br>  assembly                                      | Al skills red<br>NANCE REOL<br>il for life.<br>ups; can be l<br>by hand. | <b>IIREMENTS</b>                                                          | nstallation.                                                  | chain-                      |
| 2. Ten<br>pic                                             | or mo<br>ture)                                                                  | re home<br>for mas                                                                 | s dispo                                                                     | sal sys                                                                              | tems – mar                                                                                                 |                                                                     |                                                  | OP                                          | 2. Plumbin<br>ERATION<br>1. Motor s<br>2. Occasio<br>on-ring                                                           | g/electric<br>& MAINTE<br>ealed in c<br>nal check-<br>  assembly                                      | NANCE REOL<br>Il for life.<br>ups; can be l                              | uired for in<br>IIREMENTS                                                 | nstallation.                                                  | chain-                      |
| 2. Ten<br>pic<br>OSTS                                     | TECH                                                                            | re home<br>for mas<br>NICAL P<br>& REDUC                                           | RFORMAI                                                                     | Sa) Sys                                                                              | tems - mar                                                                                                 | OPERATIN<br>RANGES                                                  | va N                                             | OP<br>COP                                   | 2. Plumbin<br>ERATION<br>1. Motor s<br>2. Occasio<br>on-ring<br>3. Operati                                             | g/electric<br>& MAINTE<br>ealed in c<br>mal check-<br>i assembly<br>on automat                        | Al skills red<br>NANCE REOL<br>il for life.<br>ups; can be l<br>by hand. | uired for in<br>IIREMENTS                                                 | nstallation.                                                  | chain-                      |
| 2. Ten                                                    | ture)                                                                           | re home<br>for mas                                                                 | RFORMAL<br>TION, A - A<br>DO CO                                             | sa) sys                                                                              | ut<br>ALUE)                                                                                                | OPERATIN<br>RANGES<br>(TEMP, OTH<br>Submersib<br>Jiquids u          | va N<br>ieri o<br>ieri o<br>ie; Min<br>ip to noi | OP<br>OISE<br>& Dons<br>Orns<br>Se.         | 2. Plumbin<br>ERATION<br>1. Motor s<br>2. Occasio<br>on-ring<br>3. Operati<br>STANDARD                                 | g/electric<br>& MAINTE<br>ealed in c<br>mal check-<br>i assembly<br>on automat                        | Al skills red<br>NANCE REOL<br>il for life.<br>ups; can be l<br>by hand. | uired for in<br>IIREMENTS                                                 | nstallation.                                                  | chain-                      |
| 2. Ten<br>pic<br>COSTS                                    | TECH<br>(R - 5<br>BOO <sub>5</sub>                                              | re home<br>for mas<br>INICAL P<br>& REDUC                                          | RFORMAL<br>TION, A - A<br>DO CO                                             | NCE-OUTP<br>NCTUAL V<br>DD                                                           | ut<br>ALUE)                                                                                                | OPERATIN<br>RANGES<br>(TEMP, OTH<br>Submersib                       | va N<br>ieri o<br>ieri o<br>ie; Min<br>ip to noi | OF<br>OF<br>OF<br>OF<br>OF<br>Se.<br>odors. | 2. Plumbin<br>ERATION<br>1. Motor s<br>2. Occasio<br>on-ring<br>3. Operati                                             | g/electric<br>& MAINTE<br>ealed in c<br>mal check-<br>i assembly<br>on automat                        | Al skills red<br>NANCE REOL<br>il for life.<br>ups; can be l<br>by hand. | uired for in<br>IIREMENTS                                                 | nstallation.                                                  | chain-                      |
| 2. Ten<br>pic<br>OSTS<br>MODEL<br>UMBER<br>MAJORI<br>SP-5 | TECH<br>(R - )<br>BOOB                                                          | re home<br>for mas<br>INICAL P<br>& REDUC<br>S&<br>NA                              | RFORMAL<br>TION, A - A<br>DO CO                                             | NCE-OUTP<br>NCTUAL V<br>DOD                                                          | ut<br>ALUE)                                                                                                | OPERATIN<br>RANGES<br>(TEMP. OTH<br>Submersib<br>liquids u<br>150°F | vig N<br>Nerni O<br>Tre; Min<br>Ip to No         | OF<br>OF<br>OF<br>OF<br>OF<br>Se.<br>odors. | 2. Plumbin<br>ERATION<br>1. Motor s<br>2. Occasio<br>on-ring<br>3. Operati                                             | g/electric<br>& MAINTE<br>ealed in c<br>mal check-<br>i assembly<br>on automat                        | Al skills red<br>NANCE REOL<br>il for life.<br>ups; can be l<br>by hand. | uired for in<br>IIREMENTS                                                 | nstallation.                                                  | chðin-                      |

#### Septic Tanks and Accessories\*

Septic Tanks—Precast Concrete Septic Tanks, 156 American Precast Corp. Wallax—Small Chemical Precipitation Plant, 158 Anticimex Bolagen Neo Septic Tanks—ST—Aerobic-Anaerobic Septic Tanks, 160 Nishihara Environmental Sanitation Research Corp., Ltd. Septivator—Septic Tank Heater, 162 The Septivator Co. Monotank—Post Septic Tank Aerobic Unit, 164 Suburbia Systems, Inc.

# Introduction

Septic tanks are watertight chambers which retain sewage long enough for most of the solids to settle out and for some degree of anaerobic digestion of the sewage to take place. The solids and partially decomposed sludge settle to the bottom of the tank and accumulate. A scum of lightweight material (including fats and greases) rises to the top. The partially clarified liquid is allowed to flow out a pipe just below the floating scum layer. Proper baffling can offer additional protection against scum outflow.

Septic tanks come in many shapes. Several are illustrated in Figure 28. Construction details which show the sludge and scum layers are illustrated in Figure 29. Normal materials for construction are concrete and steel. Redwood is also used. Fiberglass reinforced plastic septic tanks are manufactured abroad.

Septic tanks can provide sufficient treatment to reduce suspended solids by 40 to 75 per cent and BOD by some 25 to 65 per cent. Bacterial concentrations in the effluent may be reduced also, but septic tanks cannot be relied upon to remove disease-causing microorganisms, and, depending on all sorts of uncontrollable conditions, septic tank effluent could actually have a greater concentration of microorganisms than the raw sewage (though dangerous organisms probably do not multiply inside septic tanks). Septic tank effluent is also malodorous. Septic tanks provide primary treatment and a bit of secondary treatment.

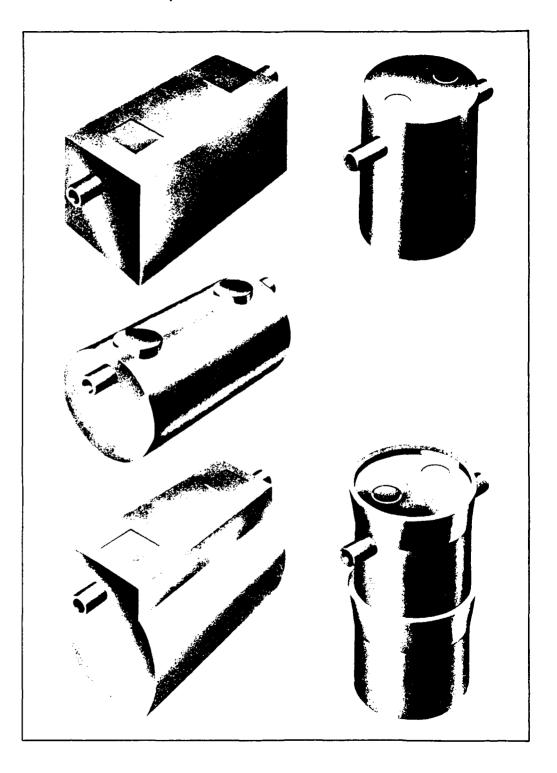
Over time, settling of solids causes the sludge to build up. This action reduces the effective volume of the tank, and thereby the average detention time of sewage is decreased. When the sludge builds up high enough, the sewage may flow through so fast that it will pull some of the sludge along with it. Sludge also tends to "boil" during warm weather. This is a matter of gases forming in the sludge, lifting particles to the surface and then dropping them. Boiling, as well as short-circuiting, can lead to sludge carry-over. The sludge can eventually clog the distribution lines and cause sewage to back up into the house. Materials that are carried out of the tank and which do not settle in the distribution lines pass to the subsurface soil absorption system. The added strain on the soil system may significantly hasten its failure. Therefore, septic tanks should be inspected on a regular basis and, when necessary, pumped out. Pumping is typically required every two to three years, but this depends greatly on many variables such as the size of the tank, the rate at which it is loaded, and the type of materials with which it is filled. (See Table 11 for a guide to septic-tank pumping.)

Much could be done to improve basic designs of septic tanks to reduce solids carryover and to improve other performance parameters. An improved tank of foreign manufacture, as well as accessories for tanks and a device for additional treatment of septic tank effluent, are included in this section.

\*[For detailed explanations and design criteria, see 5, 12, and 36.]

Fig. 28. Septic Tanks: General Shapes. Source: Manual of Septic-Tank Practice, U.S.

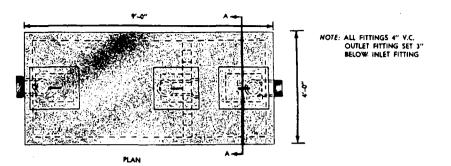
Public Health Service, DHEW Pub. No. (HSM) 72-10020 (formerly PHS Pub. No. 526) Rev. 1967, p. 31.

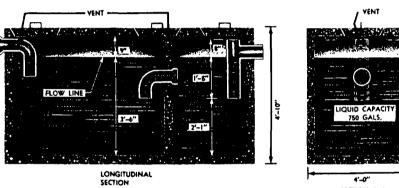


### Fig. 29. Septic Tanks: Two Designs.

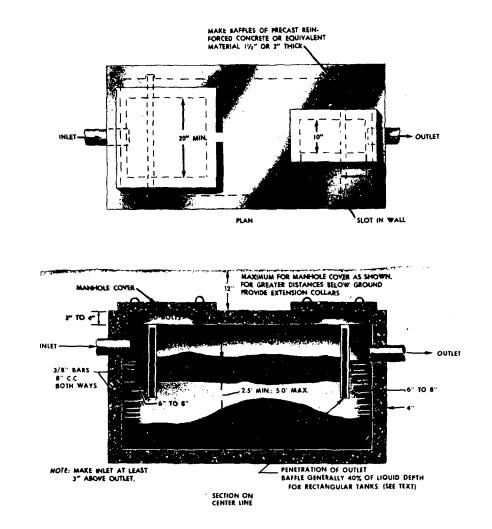
Source: Manual of Septic-Tank Practice, U.S. Public Health Service, DHEW Pub. No. (HSM) 72-10020 (formerly PHS Pub. No. 526) Rev. 1967, pp. 33 and 35.

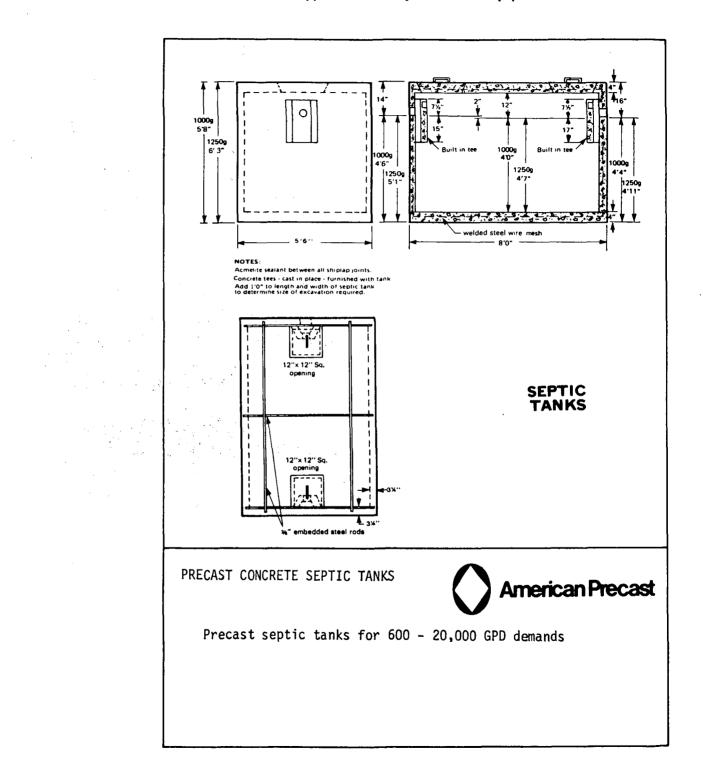
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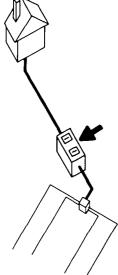


SECTION A-A

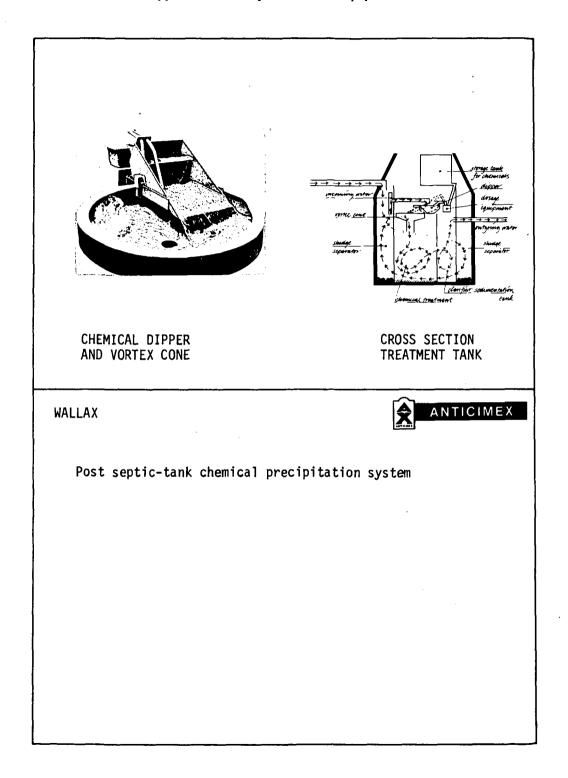




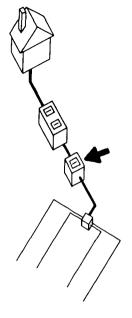
| FEATUR                                        | ES                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                  |                                                    |                                            | _                                      | <u> </u>                            |                                   | ERATION                        |                              |                                                                       | TIC TANKS       |
|-----------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------|--------------------------------------------|----------------------------------------|-------------------------------------|-----------------------------------|--------------------------------|------------------------------|-----------------------------------------------------------------------|-----------------|
| ca<br>2. 4,1<br>3. Re<br>5. Ir<br>5. Ir<br>5e | acities<br>100 PSI<br>nforcem<br>el rods<br>0 (gras<br>in pipe<br>sween al | of 60<br>test of<br>ent wi<br>sed ard<br>and co<br>l join                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0 to 20,<br>n all co<br>tn 6 x 0<br>eas) and<br>ncrete 1<br>ts.  | 000 gal<br>increte<br>No. 10<br>H-20 (<br>cees, tw | units.<br>)weldedw<br>traffict<br>omanhole | pearing) n                             | and embed<br>models.<br>te sealan   | ded                               | 2. Scum fl                     | loats on top                 | tank, solids sett<br>of sewage, liqui<br>hrough tee to dis            | d supernatant f |
|                                               |                                                                            | MENSIO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                  | г—                                                 | r                                          | r                                      |                                     | STS (DOLL)                        |                                |                              |                                                                       |                 |
| MODEL<br>NUMBER<br>(MAJOR)                    | LENGTH                                                                     | WIDTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1                                                                | WEIGHT                                             | RATED<br>CAPACITY<br>(GPD)                 | TANK<br>CAPACITY<br>(GAL.)             | SUGG. LIST<br>(FOB<br>FACTORY)      | INSTALL<br>COST                   | OPERATE                        | DESIGN<br>LIFETIME<br>(YRS.) | ELECTRICITY<br>(RATING)                                               | OPERAT          |
| 600<br>ga 1                                   | 7'                                                                         | 3'5"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 5'8"                                                             |                                                    | Depends<br>on re-<br>tention               | 600                                    |                                     |                                   |                                | Unlimited                    | None                                                                  | Sewag           |
| 5000<br>ga 1                                  | 14'                                                                        | 7'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 111                                                              |                                                    | time                                       | 5000                                   |                                     |                                   |                                |                              | u                                                                     |                 |
| 10000<br>gal                                  | 36'4"                                                                      | 9'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 7'                                                               |                                                    |                                            | 10000                                  |                                     |                                   |                                |                              | 0                                                                     |                 |
| 20000<br>ga 1                                 | 28'                                                                        | 7'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12'                                                              | ļ                                                  |                                            | 20000                                  |                                     |                                   |                                |                              |                                                                       | ļ "             |
| (4)                                           | ing dep<br>-60% of                                                         | ends o<br>total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | n local<br>) of at                                               | codes:<br>least 2                                  | day dete                                   | r a liquic<br>ention tim<br>id low pro | l volume<br>le is need<br>file styl | ed.<br>es.<br>OP                  | ERATION                        | & MAINTE                     | REMENTS<br>I base, pipe hook-<br>NANCE REQUIREN<br>but (3 to 5 years) | IENTS           |
| 1. Si:<br>(4(<br>2. Ni)<br>COSTS              | ing dep<br>-60% of<br>eteen s<br>TECH<br>(R = %                            | ends or<br>total<br>izes in<br>NICAL PE<br>REDUCT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | n local<br>) of at<br>n H-10,<br>RFORMAN                         | Codes:<br>least 2<br>H-20, r<br>KE-OUTP<br>CTUAL V | day deta<br>egular ar                      | OPERATI<br>RANGE                       | ne is need<br>file styli            | ed.<br>es.<br>OP<br>1             | ERATION<br>I. Periodi          | tion, gravel                 | I base, pipe hook-<br>NANCE REQUIREN                                  | IENTS           |
| 1. Si:<br>(4)<br>2. Nii<br>COSTS              | ing dep<br>-60% of<br>eteen s                                              | ends ou<br>total<br>izes in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | n local<br>) of at<br>n H-10,                                    | Codes:<br>least 2<br>H-20, r<br>KE-OUTP<br>CTUAL V | day deta<br>egular ar                      | OPERATI                                | ne is need<br>file styli            | ed.<br>es.<br>OP                  | ERATION<br>Periodi<br>STANDARD | tion, gravel                 | I base, pipe hook-<br>NANCE REQUIREN                                  | IENTS           |
| 1. Si:<br>(4(<br>2. Ni)<br>COSTS              | ing dep<br>-60% of<br>eteen s<br>TECH<br>(R = %                            | ends or<br>total<br>izes in<br>NICAL PE<br>REDUCT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | n local<br>) of at<br>n H-10,<br>RFORMAN                         | Codes:<br>least 2<br>H-20, r<br>KE-OUTP<br>CTUAL V | day deta<br>egular ar                      | OPERATI<br>RANGE                       | ne is need<br>file styli            | ed.<br>es.<br>OP<br>1             | ERATION<br>I. Periodi          | tion, gravel                 | I base, pipe hook-<br>NANCE REQUIREN                                  | IENTS           |
| 1. Si:<br>(4(<br>2. Ni)<br>COSTS              | ing dep<br>-60% of<br>eteen s<br>TECH<br>(R = %                            | ends or<br>total<br>izes in<br>NICAL PE<br>REDUCT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | n local<br>) of at<br>n H-10,<br>RFORMAN                         | Codes:<br>least 2<br>H-20, r<br>KE-OUTP<br>CTUAL V | day deta<br>egular ar                      | OPERATI<br>RANGE                       | ne is need<br>file styli            | ed.<br>es.<br>OP<br>1             | ERATION<br>I. Periodi          | tion, gravel                 | I base, pipe hook-<br>NANCE REQUIREN                                  | IENTS           |
| 1. Si:<br>(4(<br>2. Ni)<br>COSTS              | ing dep<br>-60% of<br>teten s<br>TECH<br>(R+%<br>600g                      | Hends on Control of Co | n local<br>) of at<br>n H-10,<br>RFORMA-J<br>ION, A - J<br>DO Ct | codes: 2<br>least 2<br>H-2D, r                     | UT<br>ALUE)                                | OPERATI<br>RANGE                       | ne is need<br>file styli            | ed.<br>es.<br>orse<br>borse<br>TE | CHNICAL All siz                | PERFORM/                     | NANCE REQUIREM                                                        |                 |



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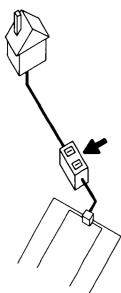


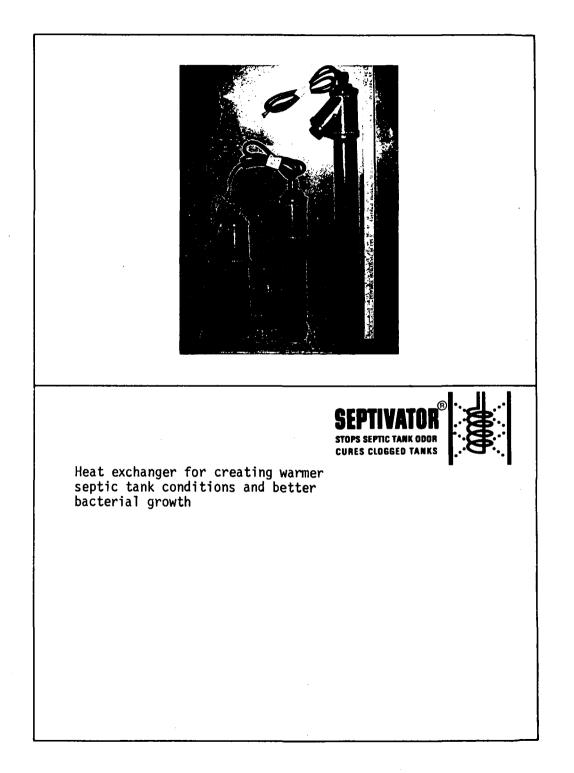
|                                                                                                                      | 1 10 S<br>L. 08/2                                  | 15 60<br>Mr, D                                                                                    | ÓLM 1,<br>)<br>ouglas (                                                                 | , SWEDE<br>Dickson,                                                          |                               | - Dev                                           |                                          |       |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SMALL C                                                                                                                              | WAL<br>HEMICAL P                                                                                |                                                                                           | ON           |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------|------------------------------------------|-------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|--------------|
|                                                                                                                      |                                                    | Antici                                                                                            | mex Al                                                                                  | 5-Water F                                                                    | urificatio                    | n Departm                                       | ent                                      |       |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                      |                                                                                                 | GED WASTE                                                                                 |              |
| 2. 7m<br>mi<br>3. Ca<br>fo                                                                                           | ow-thro<br>o-tank<br>xing an<br>n add o<br>r addeo | unit:<br>nd sedin<br>chlorine<br>d disini                                                         | (a) Se<br>rentati<br>e in th<br>fection                                                 | ptic tar<br>on tank.<br>e form o                                             | fsodium                       | ruction.<br>mbered},<br>hypochlor<br>mydraulic. | ite (ble                                 |       | (or aer<br>2. Water f<br>3. When fu<br>coagula<br>tank.<br>4. Dipper                  | ged wastewa<br>robic) tank<br>flows into<br>ull, dipper<br>ant to spin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | tipping box (<br>sends water<br>cone and the<br>upright posi                                                                         | dipper).<br>plus alumin<br>n to clarif                                                          | um sulfate (#<br>ying sediment                                                            | Alum<br>tati |
|                                                                                                                      | -                                                  |                                                                                                   |                                                                                         |                                                                              |                               |                                                 |                                          |       |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                      | <u>-</u> -                                                                                      |                                                                                           |              |
|                                                                                                                      |                                                    | DIMENSIO                                                                                          | NS                                                                                      | WEIGHT                                                                       |                               |                                                 |                                          | -     |                                                                                       | DESIGN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | UTILITY REC                                                                                                                          |                                                                                                 | OPERATING                                                                                 |              |
| (MAJOR)                                                                                                              | LENGTH                                             | WIDTH                                                                                             | HEIGHT                                                                                  | T (LB.)                                                                      | (GPD)                         | (GAL.)                                          | SUGG. LIST<br>(FOB<br>FACTORY            |       |                                                                                       | LIFETIME<br>(VRS.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ELECTRICITY<br>(RATING)                                                                                                              |                                                                                                 | SUPPLIES                                                                                  |              |
| Septic<br>tank                                                                                                       |                                                    |                                                                                                   |                                                                                         |                                                                              | 528                           | 343                                             |                                          |       |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                      |                                                                                                 |                                                                                           |              |
| WALLAX<br>proper                                                                                                     |                                                    |                                                                                                   | <br>                                                                                    | 44                                                                           | "                             | 185                                             |                                          | ļ     |                                                                                       | ļ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>_</b>                                                                                                                             |                                                                                                 | Alum <sup>1</sup>                                                                         |              |
| Combined                                                                                                             |                                                    |                                                                                                   |                                                                                         |                                                                              | "                             | 528                                             |                                          |       |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                      |                                                                                                 | <br>                                                                                      | L            |
|                                                                                                                      |                                                    |                                                                                                   |                                                                                         |                                                                              |                               |                                                 |                                          |       |                                                                                       | L                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                      |                                                                                                 |                                                                                           |              |
|                                                                                                                      |                                                    |                                                                                                   |                                                                                         |                                                                              |                               |                                                 |                                          |       |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Approxi                                                                                                                              | imately 1.7<br>)O gal. wast                                                                     | lb. Aluminum<br>ewater                                                                    | Sul          |
| SIZING                                                                                                               |                                                    |                                                                                                   |                                                                                         |                                                                              |                               |                                                 |                                          |       | OPERATION                                                                             | es leveling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | REMENTS<br>, some founda                                                                                                             | ation work.<br>JIREMENTS                                                                        |                                                                                           | 105          |
| COSTS                                                                                                                | proxima                                            |                                                                                                   | 12 <b>00</b> fo                                                                         |                                                                              | te syster                     | n, but not                                      | : yet                                    |       | 1. Require<br>OPERATION<br>1. Refill                                                  | es leveling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | REMENTS<br>, some founda<br>NANCE REQU                                                                                               | ation work.<br>JIREMENTS                                                                        |                                                                                           | les          |
| COSTS<br>). Ap<br>ma<br>model<br>NUMBER                                                                              | proxime<br>rketed<br>TECH                          | stely \$<br>in U. S                                                                               | 1200 fo<br>5.<br>я <b>голма</b><br>10 <b>0, а -</b>                                     | r comple                                                                     |                               | OPERATI<br>RANGE                                | NG 1                                     | NOISE | 1. Require<br>OPERATION<br>1. Refill<br>longer,                                       | es leveling<br>& MAINTE<br>chemicals<br>, depending                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | REMENTS<br>, some founda<br>NANCE REQU<br>and pump out<br>on use.                                                                    | ation work.<br>JIREMENTS                                                                        |                                                                                           | les          |
| COSTS<br>). Ap<br>ma                                                                                                 | TECH<br>(R - 3<br>(R) 5                            | ately \$<br>in U. S<br>MICAL PE<br>6 REDUCT<br>S3<br>(R)                                          | 1200 fo<br>5.<br>я <b>голма</b><br>10 <b>0, а -</b>                                     | nce-outre<br>Actual v<br>cod Pho                                             | UT<br>ALUE)<br>S-             | OPERATI                                         | NG 1                                     |       | 1. Require<br>OPERATION<br>1. Refill<br>longer,                                       | es leveling<br>& MAINTE<br>chemicals<br>, depending<br>OTHER<br>T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | REMENTS<br>, some founda<br>NANCE REQU<br>and pump out<br>on use.                                                                    | ution work.<br>JIREMENTS<br>sludge on 3                                                         | -6 month cyc                                                                              | les          |
| COSTS<br>). Ap<br>ma<br>model<br>NUMBER                                                                              | proxime<br>rketed<br>TECH<br>(R - 1                | ately \$<br>in U. S<br>MCAL PE                                                                    | 1200 fo<br>5.<br>я <b>голма</b><br>10 <b>0, а -</b>                                     | n comple                                                                     | UT<br>ALUE)<br>S-<br>CUS      | OPERATI<br>RANGE                                | NG 1                                     |       | 1. Require<br>OPERATION<br>1. Refill<br>longer,                                       | es leveling<br>& MAINTE<br>chemicals<br>, depending<br>OTHER<br>Bacte<br>Works                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | REMENTS<br>, some founds<br>NANCE REQU<br>and pump out<br>on use.<br>rial reduction<br>well with va                                  | JIREMENTS<br>sludge on 3<br>on up to 99%                                                        | -6 month cyc                                                                              | dent         |
| COSTS<br>}. Ap<br>ma<br>MODEL<br>NUMBER<br>(MAJOR)                                                                   | rketed                                             | ntely \$<br>in U. S<br>RECAL PE<br>S<br>RECUCT                                                    | 1200 fo<br>5.<br>я <b>голма</b><br>10 <b>0, а -</b>                                     | n comple                                                                     | UT<br>ALUE)<br>S-<br>CUS      | OPERATI<br>RANGE                                | NG 1                                     |       | 1. Require<br>OPERATION<br>1. Refill<br>longer,                                       | es leveling<br>& MAINTE<br>chemicals<br>, depending<br>Bacte<br>Works<br>clima                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | REMENTS<br>, some founda<br>NANCE REQU<br>and pump out<br>on use.                                                                    | ition work.<br>JIREMENTS<br>sludge on 3<br>on up to 99%<br>arying loads<br>irrect disch         | -6 month cyc                                                                              | dent         |
| COSTS<br>}. Ap<br>ma<br>MODEL<br>NUMBER<br>(MAJOR)                                                                   | rketed                                             | ntely \$<br>in U. S<br>RECAL PE<br>S<br>RECUCT                                                    | 1200 fo<br>5.<br>я <b>голма</b><br>10 <b>0, а -</b>                                     | n comple                                                                     | UT<br>ALUE)<br>S-<br>CUS      | OPERATI<br>RANGE                                | NG 1                                     |       | 1. Require<br>OPERATION<br>1. Refill<br>longer,                                       | es leveling<br>& MAINTE<br>chemicals<br>, depending<br>Bacte<br>Works<br>clima                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | REMENTS<br>, some founds<br>NANCE REQL<br>and pump out<br>on use.<br>rial reductio<br>well with va                                   | ition work.<br>JIREMENTS<br>sludge on 3<br>on up to 99%<br>arying loads<br>irrect disch         | -6 month cyc                                                                              | dent         |
| COSTS<br>}. Ap<br>ma<br>MODEL<br>NUMBER<br>(MAJOR)                                                                   | rketed                                             | ntely \$<br>in U. S<br>RECAL PE<br>S<br>RECUCT                                                    | 1200 fo<br>5.<br>я <b>голма</b><br>10 <b>0, а -</b>                                     | n comple                                                                     | UT<br>ALUE)<br>S-<br>CUS      | OPERATI<br>RANGE                                | NG 1                                     |       | 1. Require<br>OPERATION<br>1. Refill<br>longer,                                       | es leveling<br>& MAINTE<br>chemicals<br>, depending<br>Bacte<br>Works<br>clima                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | REMENTS<br>, some founds<br>NANCE REQL<br>and pump out<br>on use.<br>rial reductio<br>well with va                                   | ition work.<br>JIREMENTS<br>sludge on 3<br>on up to 99%<br>arying loads<br>irrect disch         | -6 month cyc                                                                              | dent         |
| COSTS<br>1. Ap<br>made<br>MODEL<br>MURADER<br>(MAJOR)<br>Combined<br>WARRAA<br>1. Se<br>of<br>2. Sc<br>fr<br>3. Hill | VTIES.<br>Scand                                    | WCALPE<br>REDUCT<br>SA<br>Up to<br>80<br>Up to<br>80<br>Up to<br>80<br>Up to<br>80<br>Up to<br>80 | RFORMA<br>RFORMA<br>ION, A -<br>DO C<br>NTEES,<br>execute<br>execute<br>cole.<br>fee pa | ACTUAL V<br>ACTUAL V<br>OD Pho<br>90<br>18<br>8 SERV<br>d with 1<br>irts and | ICE<br>nstaller,<br>labor cor | OPERATI<br>RANGE                                | NG<br>B<br>ERN<br>Cor at ti<br>rvíce con | me    | 1. Require<br>OPERATION<br>1. Refill<br>longer.<br>STANDARD<br>CODES MET<br>CODES MET | Exceling     Armonia and a second secon | REMENTS<br>, some founda<br>NANCE REQU<br>and pump out<br>on use.<br>rial reductio<br>well with va<br>te; used in c<br>) mode in Swr | ition work.<br>JIREMENTS<br>sludge on 3<br>on up to 991<br>arying loads<br>jirect disch<br>den. | -6 month cyc<br>and indepen<br>arge (to sur<br>rotection Bo<br>Council sim<br>y Extension | dent<br>face |



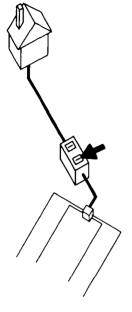


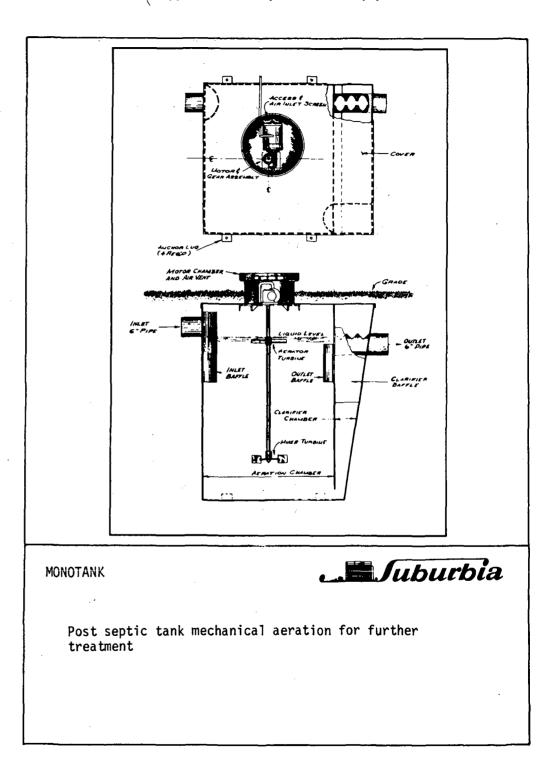
| by<br>2. De<br>wa<br>3. 2<br>wi<br>po                                                                                                            | RES<br>ptic ta<br>aerobi<br>signed<br>stewate<br>chamber<br>th effl<br>lishing                                                                                                                                                                            | c oxida<br>for tre<br>rs not<br>ed unit<br>uent pa<br>and di                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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flush<br>herefore<br>entation<br>wer wedg                                                   | plate be<br>toilet w<br>lower ra<br>-anaerobi<br>es on oxi                                              | digestio<br>d) for po<br>water <u>only</u><br>ted capac<br>c treatme<br>dation pl<br>of 5 to | lishing.<br>, other<br>ity).<br>nt chambe<br>ate bed f  | d<br>rs<br>or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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Superna<br>matters<br>3. Effluen<br>Plate B<br>4. Effluen                                                                                                                                           | tation tak<br>tant flows<br>and float<br>t flows on<br>ed" for ae<br>t flows pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| (MAJOR)                                                                                                                                          | LENGTI                                                                                                                                                                                                                                                    | WIDTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| ST-15                                                                                                                                            | 69*                                                                                                                                                                                                                                                       | 57"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| ST-20                                                                                                                                            | 73"                                                                                                                                                                                                                                                       | 61"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| ST-30                                                                                                                                            | 83"                                                                                                                                                                                                                                                       | 71"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| ST-60                                                                                                                                            | 101"                                                                                                                                                                                                                                                      | 89"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| 0.<br>2. Mo<br>(N<br><b>COSTS</b><br>1. A1<br>2. Pf                                                                                              | draulic<br>0287 lb<br>del num<br>odel 20<br>1 price<br>ping an                                                                                                                                                                                            | and wa<br>. BOD <sub>5</sub> /<br>bers co<br>has 2.1<br>s are bi<br>d speci                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ste loa<br>capita/<br>rrespon<br>0 M <sup>3</sup> vo<br>ased on<br>al eart                                                                               | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 = 30<br>hworks a                                             | times ta<br>O yen.<br>re extra                                                                          | nk volume<br>costs.<br>1 (pumpin                                                             | in M3                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1. Ventila<br>odor pro<br>2. Simple<br>3. Above g<br>4. Reinfor<br>OPERATION<br>1. Once or                                                                                                                        | blems (pro<br>excavation<br>round cover<br>cement work<br>& MAINTE<br>twice a ye                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| 1. Hy<br>0.<br>2. Mo<br>(M<br>COSTS<br>1. A1<br>2. Pf<br>3. Ma                                                                                   | draulic<br>0287 lb<br>del num<br>odel 20<br>l price<br>ping an<br>intenan                                                                                                                                                                                 | and wa<br>. BOD <sub>5</sub> /s<br>bers co<br>has 2.0<br>s are b<br>d speci<br>ce cost                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ste loa<br>capita/<br>rrespon<br>0 M <sup>3</sup> vo<br>ased on<br>al eart<br>based                                                                      | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 ≠ 30<br>hworks a<br>on sludg                                 | times ta<br>O yen.<br>re extra<br>e disposa                                                             | nk volume<br>costs.<br>l (pumpin                                                             | 1n M3<br>g).                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1. Ventila<br>odor pri<br>2. Simple<br>3. Above g<br>4. Retinforn<br>OPERATION<br>1. Once or<br>disinfe                                                                                                           | tion tube n<br>blems (pro-<br>excavation<br>ound cover<br>ement worl<br>& MAINTE<br>twice a you<br>that supp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| 1. Hy<br>0.<br>2. Mo<br>(H<br>COSTS<br>1. A1<br>2. Pf                                                                                            | draulic<br>0287 lb<br>del num<br>odel 20<br>l price<br>ping an<br>intenan                                                                                                                                                                                 | and wa<br>. BOD <sub>5</sub> /-<br>bers co<br>has 2.1<br>s are bi<br>d specifice cost<br>HNICALPI<br>% REDUC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ste loa<br>capita/<br>rrespon<br>0 M <sup>3</sup> vo<br>ased on<br>al eart<br>based<br>ERFORMA<br>TION, A =                                              | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 = 30<br>hworks a                                             | times ta<br>Oyen.<br>re extra<br>e disposa                                                              | nk volume<br>costs.                                                                          | 1n M3<br>g).                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1. Ventila<br>odor pro<br>2. Simple<br>3. Above g<br>4. Reinfor<br>OPERATION<br>1. 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| 1. Hy<br>O.<br>2. Mo<br>(H<br>COSTS<br>1. A1<br>2. P1<br>3. Ma<br>MODEL<br>NUMBER                                                                | draulic<br>0287 lb<br>del num<br>odel 20<br>l price<br>ping an<br>intenan                                                                                                                                                                                 | and wa<br>. BOD <sub>5</sub> /-<br>bers co<br>has 2.1<br>s are bi<br>d specifice cost                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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<li>Ventila<br/>odor pr<br/>2. Simple</li> <li>Above g</li> <li>Reinfor</li> <li>OPERATION</li> <li>Once or<br/>disinfe</li> </ol> STANDARD STANDARD GODES MET Japan Minis                                   | tion tuber of problems (pro-<br>bblems (pro-<br>bblems (pro-<br>secavation<br>round cover<br>ement work<br>at MAINTE<br>twice a yr<br>twice a yr<br>tant suppi<br>oxin<br>try<br>de                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| 1. Hy<br>O.<br>2. Mo<br>(H<br>COSTS<br>1. A1<br>2. P1<br>3. Ma<br>MODEL<br>NUMBER<br>(MAJOR)                                                     | draulic<br>0287 lb<br>del num<br>odel 20<br>l price<br>ping an<br>intenan<br><b>TEC</b><br>(R =<br><b>COD</b>                                                                                                                                             | and wa<br>. BOD <sub>2</sub> /<br>bers co<br>has 2.1<br>s are bi<br>d specifice cost<br>whical PI<br>% REDUC<br>SS<br>(R)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ste loa<br>capita/<br>rrespon<br>0 M <sup>3</sup> vo<br>ased on<br>al eart<br>based<br>ERFORMA<br>TION, A =                                              | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 = 30<br>hworks a<br>on sludg                                 | times ta<br>Oyen.<br>re extra<br>e disposa                                                              | nk volume<br>costs.<br>1 (pumpin<br>OPERATH<br>RANGES<br>(TEMP, OTH<br>Temperate             | 1n M3<br>g).<br>NG NG<br>IER) C<br>Zone No              | IOISE<br>BIOORS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1. Ventila<br>odor pr<br>2. Simple<br>3. Above g<br>4. Reinfor<br>OPERATION<br>7. Once or<br>disinfe<br>STANDARD<br>CODES MET                                                                                     | tion tuber of problems (pro-<br>bblems (pro-<br>bblems (pro-<br>secavation<br>round cover<br>ement work<br>at MAINTE<br>twice a yr<br>twice a yr<br>tant suppi<br>oxin<br>try<br>de                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | must extend h<br>ovides oxygen<br>skills requi<br>r/accessway.<br>k necessary f<br>INANCE REOL<br>INANCE REO | n for aerobic<br>ired plus ven<br>for deep exca<br><b>JIREMENTS</b><br>imping and ge     | treatment p<br>it hook-up kr<br>vations or n<br>installai<br>neral check- | oart)<br>nowle<br>roads<br>tion. |
| 1. Hy<br>0.<br>2. Mo<br>(N<br>COSTS<br>1. A1<br>2. P1<br>3. Ma<br>MODEL<br>NUMBER<br>INAJORI<br>ST-15                                            | draulic<br>0287 lb<br>del num<br>odel 20<br>l price<br>ping an<br>intenan<br><b>TEC</b><br>(R =<br><b>COD</b>                                                                                                                                             | and wa<br>BOD_//<br>bers Co<br>has 2.1<br>s are bi<br>d specifice cost<br>WNICAL PI<br>% REDUC<br>SS<br>(R)<br>50+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                               | times ta<br>Oyen.<br>re extra<br>e disposa                                                              | nk volume<br>costs.<br>) (pumpin<br>RANGES<br>(TEMP, ort<br>Temperate<br>condition           | jn M3<br>g).<br>zone and<br>s odo                       | KOISE<br>B<br>IDORS<br>noise<br>minor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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Simple</li> <li>Above g</li> <li>Reinfor</li> <li>OPERATION</li> <li>Once or<br/>disinfe</li> </ol> STANDARD STANDARD GODES MET Japan Minis                                   | tion tuber of problems (pro-<br>bblems (pro-<br>bblems (pro-<br>secavation<br>round cover<br>ement work<br>at MAINTE<br>twice a yr<br>twice a yr<br>tant suppi<br>oxin<br>try<br>de                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                                                                                                                                                                                                                                                         | n for aerobic<br>ired plus ven<br>for deep exca<br><b>JIREMENTS</b><br>imping and ge     | treatment p<br>it hook-up kr<br>vations or n<br>installai<br>neral check- | oart)<br>nowle<br>roads<br>tion. |
| 1. Hy<br>0.<br>2. Mo<br>(M<br>COSTS<br>1. A1<br>2. Pf<br>3. Ma<br>MODEL<br>NUMBER<br>(MAJOR)<br>ST-15<br>ST-20                                   | draulic<br>0287 1b<br>del num<br>odel 20<br>1 price<br>ping an<br>intenan<br><b>TEG</b><br>(M =<br><b>ECD</b><br><b>6</b> 5+                                                                                                                              | and wa<br>BOD_//<br>bers Co<br>has 2.1<br>s are bid<br>d speci-<br>ce cost<br>HNICAL PI<br>S REDUC<br>SE<br>IRI<br>50+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ste loa<br>capita/<br>rrespon<br>0 M <sup>3</sup> vo<br>ased on<br>al eart<br>based<br>ERFORMA<br>TION, A =                                              | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 = 30<br>hworks a<br>on sludg                                 | times ta<br>Oyen.<br>re extra<br>e disposa                                                              | nk volume<br>costs.<br>) (pumpin<br>RANGE:<br>(TEMP.OTF<br>Temperate<br>condition            | in M3<br>g).<br>KG M<br>EERI C<br>zone No<br>and<br>odo | NOISE<br>B<br>NOORS<br>noise<br>minor<br>rs 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1. Ventila<br>odor pr<br>2. Simple<br>3. Above g<br>4. Reinfor<br>OPENATION<br>CODESMET<br>Japan Minis<br>of Int. Tra<br>8 Ind. No.1                                                                              | tion tuber of problems (pro-<br>bblems (pro-<br>bblems (pro-<br>secavation<br>round cover<br>ement work<br>at MAINTE<br>twice a yr<br>twice a yr<br>tant suppi<br>oxin<br>try<br>de                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | must extend h<br>ovides oxygen<br>skills requi-<br>faccessway.<br>k necessary f<br><b>NANCE REQ</b><br>in <b>NANCE REQ</b><br>ly checks.<br>dation Plate<br>23.5<br>28.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | n for aerobic<br>ired plus ven<br>for deep exca<br><b>JIREMENTS</b><br>imping and ge     | treatment p<br>it hook-up kr<br>vations or n<br>installai<br>neral check- | oart)<br>nowle<br>roads<br>tion. |
| 1. Hy<br>0.<br>2. Mo<br>(M<br>COSTS<br>1. A1<br>2. Pf<br>3. Ma<br>3. Ma<br>MODEL<br>NUMBER<br>(MAJOR)<br>ST-15<br>ST-20<br>ST-30                 | draulic<br>0287 1b<br>del num<br>odel 20<br>1 price<br>ping an<br>intenan<br><b>TEG</b><br>( <b>R</b> -<br><b>EO</b><br><b>EO</b><br><b>E</b><br><b>E</b><br><b>E</b><br><b>E</b><br><b>E</b><br><b>E</b><br><b>E</b><br><b>E</b><br><b>E</b><br><b>E</b> | and wa<br>BOD_//<br>bers Co<br>has 2.1<br>s are bid<br>d speci-<br>ce cost<br>HNICAL PI<br>S REDUC<br>SE<br>IRI<br>50+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ste loa<br>capita/<br>rrespon<br>0 M <sup>3</sup> vo<br>ased on<br>al eart<br>based<br>ERFORMA<br>TION, A =                                              | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 = 30<br>hworks a<br>on sludg                                 | times ta<br>Oyen.<br>re extra<br>e disposa                                                              | nk volume<br>costs.<br>) (pumpin<br>RANGES<br>(TEMP, OTH<br>Temperate<br>condition<br>"      | jn M3<br>g).<br>KERI C<br>zone and<br>s odo             | NORSE ACORS<br>noise minor<br>rs 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1. Ventila<br>odor pr<br>2. Simple<br>3. Above g<br>4. Reinfor<br>OPERATION<br>1. Once or<br>disinfe<br>standard<br>coors met<br>Vapan Minis<br>8 Ind. No.1                                                       | tion tube r<br>biblers (prix<br>excavation<br>ound cover<br>ement work<br>& MAINTE<br>& MAINTE<br>& MAINTE<br>& Oxin<br>try<br>de<br>726                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | must extend h<br>ovides oxygen<br>skills requi-<br>r/accessway.<br>k necessary for<br>ear sludge pu<br>ly checks.<br>dation Plate<br>23.5<br>28.4<br>39.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | n for aerobic<br>ired plus ven<br>for deep exca<br><b>JIREMENTS</b><br>imping and ge     | treatment p<br>it hook-up kr<br>vations or n<br>installai<br>neral check- | oart)<br>nowle<br>roads<br>tion. |
| 1. Hy<br>2. Mo<br>(M<br>COSTS<br>1. A1<br>2. P1<br>3. Ma<br>MODEL<br>NUMBER<br>IMAJOR<br>ST-15<br>ST-20<br>ST-30<br>ST-60                        | draultc (<br>2027 1b)<br>del num<br>del 20<br>1 price<br>ping an<br>intenan<br><b>FECC</b><br>(R -<br><b>BODS</b><br>65+<br>"<br>"                                                                                                                        | and was and was a solution of the solution of                                                                                                                                                                                                                                                                                                                                                                                                  | ste loa<br>capita/<br>rrespon<br>D M3 vo<br>ased on<br>al eart<br>based<br>serFORMA<br>DO C                                                              | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 = 30<br>hworks a<br>on sludg<br>NMCE OUTP<br>ACTUAL V<br>COD | times ta<br>0 yen.<br>re extra<br>e dispose                                                             | nk volume<br>costs.<br>) (pumpin<br>RANGES<br>(TEMP, OTH<br>Temperate<br>condition<br>"      | jn M3<br>g).<br>KERI C<br>zone and<br>s odo             | Horse to the second sec | 1. Ventila<br>odor pr<br>2. Simple<br>3. Above g<br>4. Reinfor<br><b>OPERATION</b><br>1. Once or<br>disinfe<br><b>STANDARD</b><br><b>CODES MET</b><br>Japan Minis<br>of Int. Tra<br><u>8 Ind. No.1</u><br>"<br>"  | tion tube r<br>blems (pre-<br>excavation<br>ound cover<br>ement work<br>ement work<br>twice a yr<br>twice a yr<br>tant supp<br>tant supp<br>de<br>de<br>726                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | must extend h<br>ovides oxygen<br>skills requi-<br>r/accessway.<br>k necessary for<br>ear sludge pu<br>ly checks.<br>dation Plate<br>23.5<br>28.4<br>39.3<br>71.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | n for aerobic<br>ired plus ven<br>for deep exca<br><b>JIREMENTS</b><br>imping and ge     | treatment p<br>it hook-up kr<br>vations or n<br>installai<br>neral check- | oart)<br>nowle<br>roads<br>tion. |
| 1. Hy<br>0.2. Mo<br>(M<br>COSTS<br>1. A1<br>2. P1<br>3. Ma<br>ST-15<br>ST-20<br>ST-30<br>ST-30<br>ST-60<br>WARRA<br>1. 1<br>2. F1<br>3. Ba<br>Ni | draulte (287 ib del numo<br>del numo<br>1 price pring an<br>intenan<br>65+<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>"                                                                                                                         | and eas<br>bers co. b0Dc/.<br>bers co. b0Dc/.<br>s are b. b0Sc are<br>s are b. borner<br>s ar | ste loa<br>capita/<br>rrespon<br>0 M <sup>3</sup> vo<br>ased on<br>al eart<br>based<br>mice art<br>based<br>NTEES<br>NTEES<br>NTEES<br>for all<br>stion. | d sizing<br>day.<br>d to ten<br>lume).<br>\$1 = 30<br>hworks a<br>on sludg<br>ACTUAL V<br>2000             | times ta<br>0 yen.<br>re extra<br>e disposa<br>ur<br>ALUE)<br>ICE<br>nd tank b<br>ruction a<br>ion, and | nk volume<br>costs.<br>) (pumpin<br>RANGES<br>(TEMP.07<br>Temperate<br>condition<br>"        | in M3<br>g).<br>Repi C<br>zone And<br>s odo             | Horse to the second sec | 1. Ventila<br>odor pr<br>2. Simple<br>3. Above g<br>4. Reinfor<br>OPERATION<br>1. Once or<br>disinfe<br>Uapan Minis<br>of Int. Tra<br>Int. Tra<br>Int. No.1<br>"<br>"<br>Odors at ver<br>TECHNICAL<br>1. Jo enhal | tion tube r<br>blems (pre-<br>excavation<br>ound cover<br>ement wori<br>& MAINTE<br>twice a yr<br>twice a yr<br>twith twice a yr<br>twice a yr<br>twice a yr<br>twice a yr<br>twice a yr<br>twice | must extend h<br>ovides oxygen<br>skills requi-<br>k necessway.<br>k necessway.<br>k necessway.<br>k necessway.<br>k necessway.<br>NANCE RECO<br>ly checks.<br>dation Plate<br>23.5<br>28.4<br>39.3<br>71.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | h for aerobic<br>red plus ven<br>jor deep exca<br>JIREMENTS<br>JIREMENTS<br>Bed Area (sq | treatment thook-up kn<br>vations or installai<br>neral check-             |                                  |





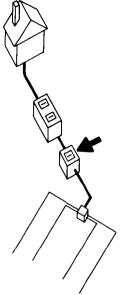
|                                                                              |                                                               |                                                         | ilbert Sc                                              |                                          |                                       |                                                                           |                       | ·                                        |                                                                                                                                        |                                                                                                | SEPTIC                                                                                                                     | TANK HEATER                              | _   |
|------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------|------------------------------------------|---------------------------------------|---------------------------------------------------------------------------|-----------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----|
| exc<br>aer<br>2.3 s<br>3. Hea<br>rec                                         | ermosta<br>changer<br>ation<br>sized m<br>at exch<br>duction  | for sep<br>compartm<br>odels fo<br>ange boo<br>. BOD re | otic tan<br>ments.<br>or 750 -<br>osts bio<br>eduction | ks, Imh<br>2000 g<br>logical             | off tanks<br>al. tanks<br>digestic    | esistance<br>, trash t<br>,<br>n rates,<br>; and skim                     | raps and sludge       |                                          | compart<br>2. Periodi<br>reductio<br>3. Increase                                                                                       | tor is num<br>ments to h<br>c heating<br>on of wast<br>es digesti                              | g at entrance to sep<br>eat influent.<br>(few hours/day) adds<br>es.<br>on, eliminates odor,<br>om 60% to 80% in tra       | ; extra heat for b<br>, reduces scum and | iol |
|                                                                              | <b>-</b>                                                      | MENSIO                                                  |                                                        | r                                        |                                       | T                                                                         |                       |                                          |                                                                                                                                        |                                                                                                |                                                                                                                            |                                          |     |
| MODEL<br>NUMBER<br>(MAJOR)                                                   | LENGTH                                                        |                                                         | HEIGHT                                                 | WEIGHT<br>(LB.)                          | RATED<br>CAPACITY<br>(GPD)            | TANK<br>CAPACITY<br>IGALJ                                                 | SUGG, LIST<br>(FOB    |                                          |                                                                                                                                        | DESIGN<br>LIFETIME<br>(YRS.)                                                                   | ELECTRICITY<br>IRATING                                                                                                     | OPERATING<br>SUPPLIES                    |     |
| 300                                                                          | 3"                                                            | ound                                                    | 16"                                                    |                                          |                                       | to be<br>used in                                                          | FACTORY               | 50-100                                   | 16.25/                                                                                                                                 | 20                                                                                             | 120 V AC<br>@ 300 W                                                                                                        | None                                     |     |
| 600                                                                          |                                                               | 1                                                       | 19"                                                    |                                          |                                       | 750<br>used in<br>1000 -<br>1250                                          | 145.                  |                                          | 25-50/<br>year                                                                                                                         |                                                                                                | 120 or<br>240 V AC<br>8 600 W                                                                                              | · ·                                      |     |
| 1250                                                                         |                                                               | <u> </u>                                                | 31"                                                    |                                          |                                       | used in<br>1500 -<br>2000                                                 | 195.                  | "                                        | 50-150/<br>year                                                                                                                        | "                                                                                              | 120 or<br>240 V AC<br>@1250 H                                                                                              |                                          | -   |
| ins<br>COSTS                                                                 | tiple -<br>stallat                                            | septivat<br>ions.                                       | ors can                                                | be and                                   |                                       | en used in                                                                |                       | 0                                        | pipe, LI<br>2. Electri<br>PERATION                                                                                                     | nt needed<br>B's, 14/2<br>cian skill<br>& MAINTE                                               | for installation is<br>U.F. cable, and cord<br>s needed to install.<br>NANCE REQUIREME                                     | NTS                                      |     |
| 1. Mul<br>ins<br>COSTS<br>1. Cos<br>jac                                      | tiple<br>stallat<br>sts inc<br>sket and<br>stra).<br>TECH     | septivations.<br>Jude onl<br>d electr                   | ors can<br>y Septi                                     | vator-h<br>rd, <u>No</u><br>CCUAL V      | eating ur<br><u>t</u> tanks c         | or used in<br>tit enclos<br>or other e<br>GPERATH<br>RANGES<br>(TEMP, OTH | ed in pig<br>quipment | e<br>Orise<br>Doors<br>noise             | 1. Equipme,<br>pipe, LI<br>2. Electrin<br>PERATION<br>1. No rout<br>frequent<br>STANDARDE<br>CODES MET<br>Under testen<br>to be testen | nt needed<br>B's, 14/2<br>cian skill<br>& MAINTE<br>ine servic<br>cy on sept                   | for installation is<br>U.F. cable, and cord<br>s needed to install.<br>NANCE REQUIREME<br>e needed, decreases              | NTS                                      |     |
| 1. Mul<br>ins<br>COSTS<br>1. Cos<br>jac<br>(ex<br>MODEL<br>MUMBER<br>(MAJOR) | tiple<br>stallat<br>sts inc<br>sket ani<br>(R-1<br>(R)<br>23% | septivations.                                           | y Septi<br>ical co                                     | vator-h<br>rd. <u>No</u><br>CE-OUTP<br>D | eating ur<br>t tanks c<br>ur<br>ALUE) | OPERATI<br>RANGEI<br>(TEMP, OT                                            | ed in pip<br>quipment | ie O<br>wist<br>worst<br>noise<br>odors. | 1. Equipme<br>pipe, LI<br>2. Electric<br>PERATION<br>1. No rout<br>frequence<br>STANDARD<br>CODES MET                                  | nt needed<br>Bis, 14/2<br>cian skill<br>& MAINTE<br>may an | for installation is<br>U.F. cable, and cord<br>s needed to install.<br>NANCE REQUIREME<br>e needed, decreases<br>ic tanks. | NTS                                      |     |





# Septic Tanks and Accessories

| FEATUR                                 | ES                                     | <del>.</del>                           |                               |                             | President,        |                                |                                |                                             | PERATION                                                                                        |                                                                            | L                                                                                       |              |                              |     |
|----------------------------------------|----------------------------------------|----------------------------------------|-------------------------------|-----------------------------|-------------------|--------------------------------|--------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------|------------------------------|-----|
| ta<br>2. Me<br>50<br>3. Fil            | nk.<br>chanica<br>lids oxy<br>berglass | l aerati<br>genatic                    | ion has<br>on.<br>orced ti    | dual le                     |                   | effluent f<br>ine for li<br><. |                                |                                             | <ol> <li>Superna<br/>aeratio</li> </ol>                                                         | itant flows<br>on tank.                                                    | nters tank,<br>into clarif;<br>lischarged ov                                            | ying area, s | eriodicaliy.<br>olids flow b | ac  |
| MODEL                                  | ,                                      | MENSIO                                 |                               |                             | RATED             | TANK                           | a                              | STE (DOLL                                   | ARS                                                                                             | DESIGN                                                                     | UTILITY RE                                                                              | QUIREMENTS   | <u> </u>                     | T   |
| NUMBER<br>(MAJOR)                      | LENGTH                                 | WIDTH                                  | HEIGHT                        | (LB.)                       | CAPACITY<br>(GPD) | CAPACITY<br>(GAL.)             | SUGG, LIST<br>(FOB<br>FACTORY) | INSTALL<br>COST                             | OPERATE<br>COET                                                                                 | LIFETIME<br>(YRS.)                                                         | ELECTRICITY<br>(RATING)                                                                 |              | OPERATING<br>SUPPLIES        |     |
| Monotank                               | 4'6"                                   | 3'6"                                   | 5'                            | 350                         | 500               | 620                            |                                |                                             |                                                                                                 |                                                                            | 110 V AC                                                                                |              |                              | I   |
|                                        |                                        |                                        |                               |                             |                   |                                |                                |                                             |                                                                                                 |                                                                            |                                                                                         |              |                              |     |
|                                        |                                        |                                        |                               |                             |                   |                                |                                |                                             |                                                                                                 |                                                                            |                                                                                         |              |                              | Γ   |
|                                        |                                        |                                        |                               |                             |                   |                                |                                |                                             |                                                                                                 |                                                                            |                                                                                         | 1            |                              | T   |
| SIZING<br>1. Sti<br>COSTS              |                                        | VTH PO<br>ze model                     |                               | L                           |                   |                                |                                | OF                                          | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a                                              | at surfac<br><b>&amp; MAINTE</b>                                           | REMENTS<br>ig hook-up an<br>ie necessary.<br>NANCE REOU<br>ng of gear b<br>ionally need | JIREMENTS    | skills need                  | ed  |
| 1. Si                                  | ngle si                                | ze model                               | ı.                            |                             |                   |                                |                                | OF                                          | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a                                              | tion, pipin<br>at surfac                                                   | ng hook-up an<br>ne necessary.<br>NANCE REQU                                            | JIREMENTS    | skills need                  | led |
| COSTS                                  | ngle siz<br>TECH<br>IR - N             | NICAL PE                               | RFORMAI                       | ICE-OUTPI                   |                   | OPERATI                        |                                | Of<br>Dist                                  | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a<br>2. Pumping                                | ion, pipin<br>at surfac<br><b>&amp; MAINTE</b><br>Innual oili<br>out occas | ng hook-up an<br>ne necessary.<br>NANCE REQU                                            | JIREMENTS    | skills need                  | ed  |
| MODEL<br>NUMBER<br>(MAJOR)             | TECH<br>IR - 1<br>UP to                | NICAL PE                               | I .                           | ICE-OUTPI                   |                   |                                | iere) q<br>Mini                | OF<br>DISE<br>B<br>DORS<br>T                | <ol> <li>Excavat</li> <li>Grating</li> <li>ERATION</li> <li>Twice a</li> <li>Pumping</li> </ol> | ion, pipin<br>at surfac<br><b>&amp; MAINTE</b><br>Innual oili<br>out occas | ng hook-up an<br>ne necessary.<br>NANCE REQU                                            | JIREMENTS    | skills need                  | led |
| COSTS                                  | TECH<br>IR - N<br>IR - N               | NICAL PE                               | RFORMAI                       | ICE-OUTPI                   |                   | RANGES                         | ien) q<br>Mino<br>nois         | OF<br>DISE<br>BOORS                         | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a<br>2. Pumping                                | ion, pipin<br>at surfac<br><b>&amp; MAINTE</b><br>Innual oili<br>out occas | ng hook-up an<br>ne necessary.<br>NANCE REQU                                            | JIREMENTS    | skills need                  | ed  |
| MODEL<br>NUMBER<br>(MAJOR)             | TECH<br>IR - 1<br>UP to                | NICAL PE                               | RFORMAI                       | ICE-OUTPI                   |                   | RANGES                         | ien) q<br>Mino<br>nois         | OF<br>DISE<br>DORS<br>r<br>e and            | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a<br>2. Pumping                                | ion, pipin<br>at surfac<br><b>&amp; MAINTE</b><br>Innual oili<br>out occas | ng hook-up an<br>ne necessary.<br>NANCE REQU                                            | JIREMENTS    | skills need                  | ed  |
| MODEL<br>NUMBER<br>(MAJOR)             | TECH<br>IR - 1<br>UP to                | NICAL PE                               | RFORMAI                       | ICE-OUTPI                   |                   | RANGES                         | ien) q<br>Mino<br>nois         | OF<br>DISE<br>DORS<br>r<br>e and            | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a<br>2. Pumping                                | ion, pipin<br>at surfac<br><b>&amp; MAINTE</b><br>Innual oili<br>out occas | ng hook-up an<br>ne necessary.<br>NANCE REQU                                            | JIREMENTS    | skills need                  | led |
| MODEL<br>NUMBER<br>(MAJOR)             | TECH<br>IR - 1<br>UP to                | NICAL PE                               | RFORMAI                       | ICE-OUTPI                   |                   | RANGES                         | ien) q<br>Mino<br>nois         | OF<br>DISE<br>DORS<br>r<br>e and            | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a<br>2. Pumping                                | ion, pipin<br>at surfac<br><b>&amp; MAINTE</b><br>Innual oili<br>out occas | ng hook-up an<br>ne necessary.<br>NANCE REQU                                            | JIREMENTS    | skills need                  |     |
| Noose<br>Moose<br>Monotank<br>Monotank | TECH<br>IR - %<br>Fine<br>Up to<br>85  | NICAL PER<br>NICAL PER<br>NEDUCT<br>ST | RFORMAN<br>ION A + A<br>DO CO | ICE-OUTPI<br>ICTUAL V<br>ID |                   | RANGES                         | ien) q<br>Mino<br>nois         | or<br>poist<br>poist<br>r<br>e and<br>dors. | 1. Excavat<br>2. Grating<br>PERATION<br>1. Twice a<br>2. Pumping<br>STANDARD<br>CODES MET       | ion, pipin<br>at surfac<br><b>&amp; MAINTE</b><br>Innual oili<br>out occas | g hook-up an<br>e necessary.<br>NANCE REOU<br>ng of gear b<br>ionally need              | JIREMENTS    | skills need                  |     |



### Individual Home Aerobic Treatment Units

Sewerless Toilet-Diffused Air, Extended Aeration Unit, 170 Aera-Filt Systems, Inc. Septi-Care—Aerobic Treatment Unit, 172 Allenaire, Inc. Cromaglass-Diffused Air, Filter Bag Unit, 174 Cromaglass Corporation Waste-Tamer-Pressure Chamber Aerated Treatment System, 176 Environmental Services, Inc. Flygt 4291-Diffused Air, Contact Stabilization Unit. 178 Flygt Corporation Jet Home Plant-Mechanical Aeration Unit, 180 Jet Aeration Co. Hi-Bakkie-Disk Aeration, Activated Sludge System, 182 Hitachi Corporation Annelgester-Redwood Trickling Filter Unit, 184 Microphor, Inc. Multi-Flo FT—Aerated Flow-Through Filter Unit. 186 Multi-Flo, Inc. Nay-Sci, The Answer-Extended Acration Treatment Unit, 188 Nayadic Sciences, Inc. News 1000G-Individual Aerobic Treatment Unit. 190 New England Wastewater Systems, Inc. Neo Aerobic Tanks-AR-Aerobic Treatment Plant, 192 Nishihara Environmental Sanitation Research Corp., Ltd. Plast-A-Form—Filtered Extended Aeration Unit. 194 Plast-A-Form Corporation CT-86-Activated Sludge, Tertiary Treatment Home Plant, 196 Pollution Control Systems, Inc. Microx—Batch Process Extended Aeration Unit, 198 Pollutrol Technology, Inc. Thiokol-MPB-10-Catalytic Reactor Filter-Incinerator, 200

## General Physical Descriptions

On-site aerobic tanks can be as simple physically as a septic tank into which compressed air is introduced and bubbled through the sewage to maintain aerobic rather than septic conditions. One manufacturer varies this approach by circulating the liquor through a pressure vessel where greater amounts of oxygen can be dissolved in the liquid than under atmospheric pressure. There are indeed a variety of approaches to maintaining aerobic conditions.

Most of the plants fall into the 300 to 1000-gpd size range, with the majority of these at or below 600 gpd. The smaller units obviously depend on processes which treat sewage faster than a septic tank in order that more treatment (e.g., 1.5-2.0 times as much BOD reduction as a septic tank) may be given in less time (one day average retention time as compared with two days design objective for a septic tank). One approach to speeding up treatment is to break up solids mechanically, thus yielding more surface area on which the microorganisms can operate. Methods for breaking up solids include the use of propellers to create turbulence, high pressure jets which converge at a solid surface, vigorous blowing of air through "diffusers" coupled with a tank geometry that will encourage turbulence, and rotating disks that at once break up solids and mix air with the liquid.

Ever mindful that solids carry-over into the final effluent should be minimized, manufacturers have taken a variety of steps to screen solids from the outlet. The approaches include weirs or skimmers for floating scum, settling of solids through hydraulic design of a clarifying chamber, and mechanical filtering through a felt-like pad or bag. The mechanical filter bag is said to also perform additional biological treatment by virtue of the communities of microorganisms which subsist within the filter matrix and feed off materials in the liquids which pass through.

Between the breaking up of solids near the inlet and the screening of solids at the outlet, a remarkable variety of arrangements for sewage treatment has been employed. Process flow is attained passively by gravity and hydraulic displacement, by pumps, and by rather elaborate assemblies of air lifts. The more elaborate the provision for process flow, the more distinct the separation into individual chambers. For example, one system has five chambers and five airlifts. At the other extreme, there are units where chambers are really zones created by baffles and in which process flow is by hydraulic displacement.

One family of units uses redwood bark as a trickling filter medium and recirculates the liquor over and through the filter.

Another manufacturer obtains multiple-use duty from one chamber by sequencing operations: a single chamber acts as an aeration chamber when solids are kept in suspension by an active air diffuser; the same chamber acts as a settling chamber when the air compressor is turned off in the wee hours of the morning; the chamber becomes

#### Individual Home Aerobic Treatment Units

the discharge chamber when the clarified supernatant is pumped out at the end of the daily cycle; and, finally, when the air compressor is turned back on, the sludge is re-aerated much as in a contact stabilization plant.

### Costs

The cost picture\* is complicated by two things: (1) at least two Japanese manufacturers and one Swedish manufacturer plan to market their units in the U.S., but have not as yet established firm pricing; and (2) many manufacturers have been vague in distinguishing between the various costs involved with their units. Examples of the latter uncertainty are encountered with units which are designed for mating to locally obtained tanks. It was not clear when a manufacturer stated "installed in dealer-furnished tanks" whether the quoted list price of the unit also included the cost of the tank (which could cost several hundred dollars). Nor would most manufacturers speculate about the range of installation costs or about the soil absorption system requirements. Further, a few units contain disinfection devices such as chlorinators or ozonators, but others do not come so equipped. If disinfection is required for a particular installation, \$200 to \$300 should be added to the cost of units not equipped with disinfectors.

Most of the units fall in the \$600 to \$1200 range as quoted by the manufacturers. Several of the larger units (above 750 gpd) cost more than \$2000, but these could serve more than one housing unit. Many of the lower-priced units (\$600 to \$800) may have been quoted without the tank. As a general guideline, then, it would be reasonable to expect to pay between \$1000 and \$1200 for a home aerobic plant of sufficient capacity to meet the requirements of many states (which are based on septic tank sizing principles as a hedge against aerobic plant failures).

Depending on all sorts of particulars, such as labor rates, skill requirements, soil suitability and local practices, installation costs ranging from \$200 to about \$800 (includes the soil absorption system) can be anticipated. At this point these are merely educated guesses, though they compare well with the limited information about installation furnished by some manufacturers.

Operating costs of about \$2 to \$3 per month for electricity plus about \$1 per month for chlorine chemicals can be anticipated. Electrical consumption will, of course, vary among units, and cost will also vary with local power rates.

Maintenance costs will range between \$50 and \$100 per year for service contracts.

The initial capital cost and maintenance costs are likely to be very sensitive to market considerations. Promotional costs presently account for a large share of list prices. When

<sup>\*</sup>At present pricing levels, most aerobic units (even without the soil absorption system) cost more than a septic tank and its soil absorption system combined. Aerobic units become competitive when soil limitations rule out conventional septic tank systems.

and if sales volumes increase and permit higher production rates, economies of scale can be expected to lead to price decreases (fixed production and promotion costs can be spread over more units).

#### Performance

All of the physical differences and costs are subordinate to performance. Performance includes not only the immediate and long-term reduction of impurities, but reliability of the unit, ease of maintenance, and even the ability of a unit or system design to respond to the highly variable loadings that might be expected from individual homes (house-to-house variations in loading tend to be smoothed out in a centralized collection and treatment system).

Under variable loading conditions, aerobic plants are subject to sludge bulking, a phenomenon characterized by the failure of the sludge to settle. Consequently, the bulked sludge can be carried out into the distribution lines and can cause clogging. In large plants, the operators can react to the bulking and minimize its effects. The problem can be more severe in small unattended units.

The performance standards and criteria developed by the National Sanitation Foundation (especially Standard Number 40 for individual aerobic units) are included in Appendix B. Though NSF Standard Number 40 is the only generally agreed upon industry-wide standard in the U. S., to date only four of the sixteen manufacturers represented herein have submitted units for testing under the Standard. Though failure to obtain NSF testing and approval does not mean that a plant will not perform adequately, there is little basis for assessing performance data (e.g., "90-plus per cent BOD removal") submitted by manufacturers who have not undergone NSF testing. It should be noted that the NSF tests under Standard 40 do not assess a plant's ability to respond to variable surges or shock loadings.

Whatever the peak performance, it can only be maintained if as much attention is invested in supervising the installation and ensuring the continued care and servicing of the plant as goes into the initial choice of a unit. Without regular attention by competent service personnel, even the best of plants can become dangerous polluters. If septic tanks and soil absorption systems have been ruled out, and if long-term servicing by qualified personnel cannot be reasonably anticipated, the designer should consider other alternatives such as composite and centralized systems employing sewers (even if the costs of sewer lines far exceed the costs of individual systems), incinerator toilets, or privies.

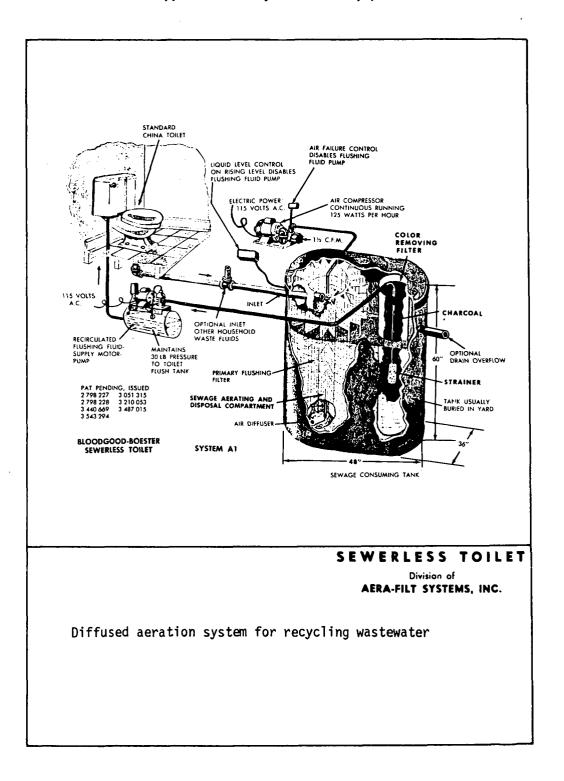
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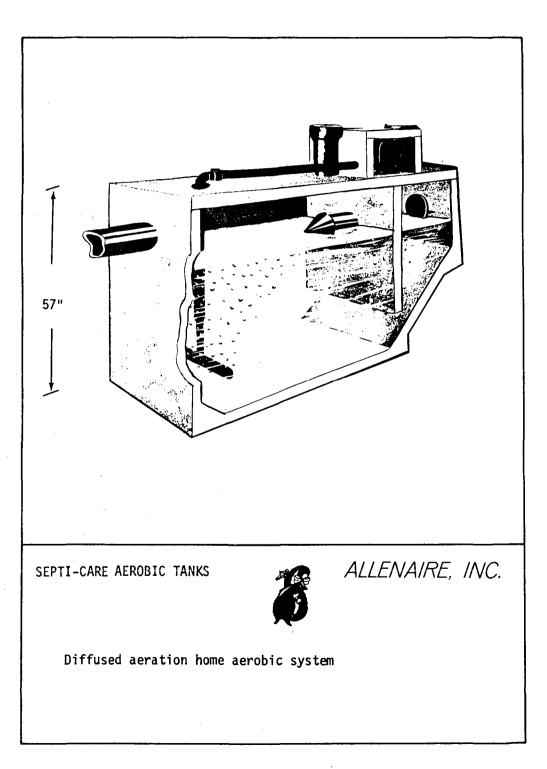
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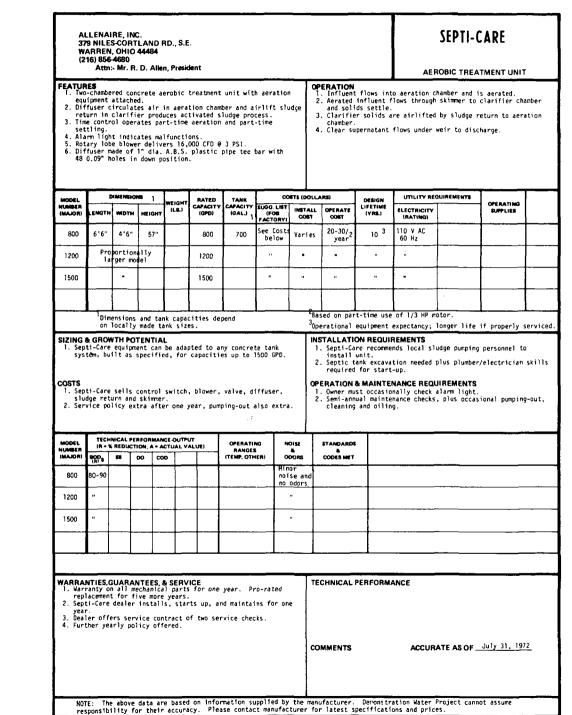
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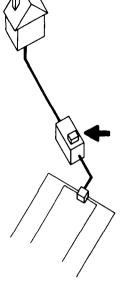
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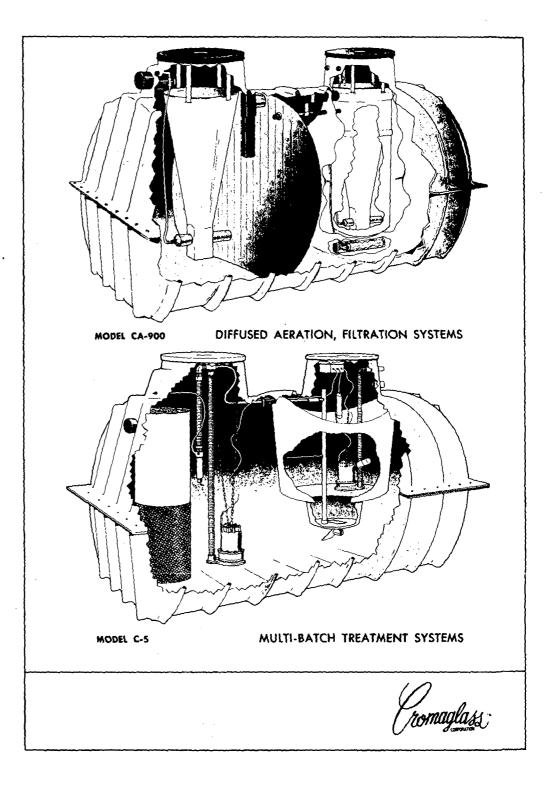
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| for<br>2. For<br>3. For<br>4. Thr<br>fil<br>5. Sys<br>6. Sys<br>7. Eff<br>pun                 | es syste<br>toilet<br>use wh<br>use wh<br>ee mode<br>tration<br>stem A-2<br>stem A-1<br>fluent i<br>nped for | t use)<br>here wa<br>here se<br>els, al<br>h.<br>has t<br>l also<br>is take<br>toile | to dis<br>iter is<br>wage 1<br>il use<br>two tani<br>has ch<br>en from<br>et flus | pose of<br>in shor<br>iquid di<br>air diffi<br>ks, sepa<br>arcoal f<br>sewage<br>hing re-        | tank (or g                                                                                                                                                                  | ce.<br>difficul<br>ters A-1<br>ey" and "b<br>grey water                                                                       | t.<br>and A-3<br>black" wa<br>tank) a                    | red A.<br>1<br>2<br>use 3<br>stes. B.<br>nd 1<br>2                        | <ol> <li>Water fr<br/>is diffu<br/>piped fo</li> <li>Control<br/>disables</li> <li>System A-</li> <li>Toilet w<br/>and effi</li> <li>Second t<br/>supernal</li> </ol>         | -1 and Sys<br>is flushed<br>for toilet<br>used, filt<br>or re-use.<br>system:<br>toilet.<br>-2<br>water from<br>luent disc<br>tank takes<br>tant for t | tem A-3<br>with pumped<br>(other water<br>ered, then pa<br>(System A-3<br>failure of pu<br>pumped flush<br>harged for di<br>other househ<br>otlet flushin<br>System A-1. | optional) g<br>sses through<br>without cha<br>mp, compress<br>ing goes to<br>sposal.<br>old water, d | oes to tank<br>charcoal fi<br>rcoal filter<br>or or overfl<br>tank and is | (g<br>lt<br>.)<br>ow<br>ae |
| HODEL                                                                                         | ,                                                                                                            | DIMENSI                                                                              | ONS                                                                               | 1                                                                                                | RATED                                                                                                                                                                       | TANK                                                                                                                          |                                                          | OSTS IDOLL                                                                | ARSI                                                                                                                                                                          | DESIGN                                                                                                                                                 |                                                                                                                                                                          | UIREMENTS                                                                                            |                                                                           | T                          |
| NUMBER<br>(MAJOR)                                                                             | LENGTH                                                                                                       | WIDTH                                                                                | I HEIGI                                                                           | HT (LB.)                                                                                         | CAPACITY<br>(GPD)                                                                                                                                                           | CAPACITY<br>IGALJ                                                                                                             | SUGG. LIS<br>(FOB<br>FACTORY                             |                                                                           | COST 2                                                                                                                                                                        | LIFETIME<br>(YRS.)                                                                                                                                     | ELECTRICITY<br>(RATING)                                                                                                                                                  |                                                                                                      | OPERATING<br>SUPPLIES                                                     | l                          |
| A-1                                                                                           | 48"                                                                                                          | 36"                                                                                  | +                                                                                 |                                                                                                  | l family                                                                                                                                                                    | <u> </u>                                                                                                                      | See c                                                    | osts below                                                                | Electri-<br>city -<br>20/year                                                                                                                                                 |                                                                                                                                                        | 115-120 V<br>AC; 60 Hz                                                                                                                                                   |                                                                                                      | None                                                                      | ļ                          |
| A-2                                                                                           | Two                                                                                                          | 18" sp<br>tank                                                                       | herical<br>s                                                                      | '  <br>                                                                                          |                                                                                                                                                                             | 600<br>total                                                                                                                  |                                                          | .                                                                         |                                                                                                                                                                               |                                                                                                                                                        |                                                                                                                                                                          |                                                                                                      |                                                                           | ┞                          |
| A-3                                                                                           | 36"                                                                                                          | 36"                                                                                  | 60'                                                                               | ·                                                                                                |                                                                                                                                                                             | 150~200                                                                                                                       |                                                          | ·                                                                         | "                                                                                                                                                                             |                                                                                                                                                        | "                                                                                                                                                                        |                                                                                                      | •                                                                         | ļ                          |
|                                                                                               | 'Als<br>flu                                                                                                  | o spac<br>id flu                                                                     | e needi<br>shing n                                                                | motor pur                                                                                        | ir compres:<br>rp.                                                                                                                                                          |                                                                                                                               |                                                          |                                                                           | 5611100                                                                                                                                                                       | costs add                                                                                                                                              |                                                                                                                                                                          |                                                                                                      |                                                                           | _                          |
| lar<br>COSTS<br>1. Lis<br>con                                                                 | t costs<br>trols, tallati                                                                                    | avail<br>piping<br>on cos                                                            | able fr<br>and ta<br>ts acco                                                      | IAL<br>ded to synd compre-<br>nom deale<br>anks.<br>ording to<br>ACTUAL Y<br>FL<br>Up            | rp.<br>ystem with<br>er include<br>p situation<br>rut<br>rer<br>rer<br>rer<br>rer<br>rer<br>rer<br>rer<br>rut<br>rer<br>rut<br>rut<br>rut<br>rut<br>rut<br>rut<br>rut<br>ru | larger ta<br>1/2 CFM) s<br>pump, com                                                                                          | service.<br>mpressor.<br>quirement<br>s<br>ter)<br>cili- | nd 1<br>2<br>3<br>4<br>OP<br>1<br>1<br>ts). 2<br>3<br>Noise<br>6<br>000as | STALLATI<br>Outside<br>Electric<br>Plumber/<br>piping t<br>Discharg<br>ERATION<br>Controls<br>or overf<br>Pumping                                                             | ON REQUI<br>excavation<br>ian servic<br>installer<br>o toilet.<br>e arrangen<br>& MAINTE<br>disable f<br>low of sys<br>of sewage<br>tant clear         | REMENTS<br>for cylind<br>te for instal<br>service for i<br>ments needed<br>NANCE REQU                                                                                    | lation of pu<br>hookup of re<br>for System A<br>JIREMENTS<br>, notifying<br>ssible clean             | mp and compr<br>cycling plas<br>-2.<br>owner of bre<br>ing of filte       | ti<br>ak<br>rs             |
| 1. Mor<br>Jar<br>COSTS<br>1. Lis<br>con<br>2. Ins<br>MODEL<br>NUMBER<br>(MAADR)<br>A-1        | t costs<br>trols, '<br>tallati                                                                               | avail<br>piping<br>on cos                                                            | able fr<br>and ta<br>ts acco                                                      | ANCE OUTT                                                                                        | ystem with<br>essor ( 1<br>er include<br>o situation<br>rER<br>ON<br>to 1<br>50<br>to 1<br>50<br>to 1                                                                       | Jarger t.<br>1/2 CFN) :<br>pump, com<br>n (see rec<br>oPERATH<br>RANGES<br>(TEM, OTH<br>Indoor fac<br>ties, tan<br>undergrout | service.<br>mpressor.<br>quirement<br>s<br>ter)<br>cili- | nd 1<br>2<br>3<br>4<br>OP<br>1<br>1<br>ts). 2<br>3<br>Noise<br>6<br>000as | STALLATI<br>Outside<br>Electric<br>Plumber/<br>piping t<br>Controls<br>or overf<br>Pumping<br>Disinfec<br>STANDARDE<br>CODES MET<br>atents pen<br>ng; issued                  | ON REQUI<br>excavation<br>ian servic<br>installer<br>o toilet.<br>e arrangen<br>& MAINTE<br>disable f<br>low of sys<br>of sewage<br>tant clear         | REMENTS<br>of for cylind<br>ce for instal<br>service for i<br>ments needed<br>NANCE REQU<br>Flushing pump<br>item.<br>required, po                                       | lation of pu<br>hookup of re<br>for System A<br>JIREMENTS<br>, notifying<br>ssible clean             | mp and compr<br>cycling plas<br>-2.<br>owner of bre<br>ing of filte       | ti<br>ak<br>rs             |
| 1. Mor<br>lar<br>COSTS<br>1. Lis<br>con<br>2. Ins<br>MODEL<br>NUMBER<br>(MAJOR)<br>A-1<br>A-2 | t costs<br>trols,<br>tallati<br>RecH<br>8005<br>98                                                           | avail<br>piping<br>on cos                                                            | able fr<br>and ta<br>ts acco                                                      | motor puin<br>IAL<br>ded to synd<br>anks.<br>ording to<br>ANCE OUTT<br>- ACTUAL V<br>COD WAT<br> | ystem with<br>essor ( 1<br>er include<br>o situation<br>rER<br>ON<br>to 1<br>50<br>to 1<br>50<br>to 1                                                                       | larger t.<br>1/2 CFN) :<br>pump, com<br>n (see rec<br>OPERATH<br>RAMMGE<br>Indoor fac<br>ties, tani<br>Undergrout<br>"        | mpressor<br>quirement<br>stern<br>cili-<br>k<br>nd       | nd 1<br>3<br>4<br>OP<br>1<br>ts). 2<br>3<br>NOISE<br>000085               | STALLATI<br>Outside<br>Electric<br>Plumber, Plumber<br>Plumber, Discharg<br>ERATION<br>Or overf<br>Purping<br>STANDAROS<br>STANDAROS<br>COOES MET<br>atents pen<br>ng; issued | ON REQUI<br>excavation<br>installer<br>installer<br>e arrangen<br>disable 1<br>low of sys<br>of sewage<br>tant clear                                   | REMENTS<br>of for cylind<br>ce for instal<br>service for i<br>ments needed<br>NANCE REQU<br>Flushing pump<br>item.<br>required, po                                       | lation of pu<br>hookup of re<br>for System A<br>JIREMENTS<br>, notifying<br>ssible clean             | mp and compr<br>cycling plas<br>-2.<br>owner of bre<br>ing of filte       | ti<br>ak<br>rs             |

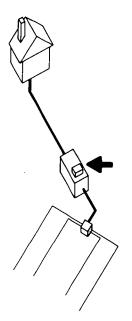


# Appendix C: Survey of Available Equipment

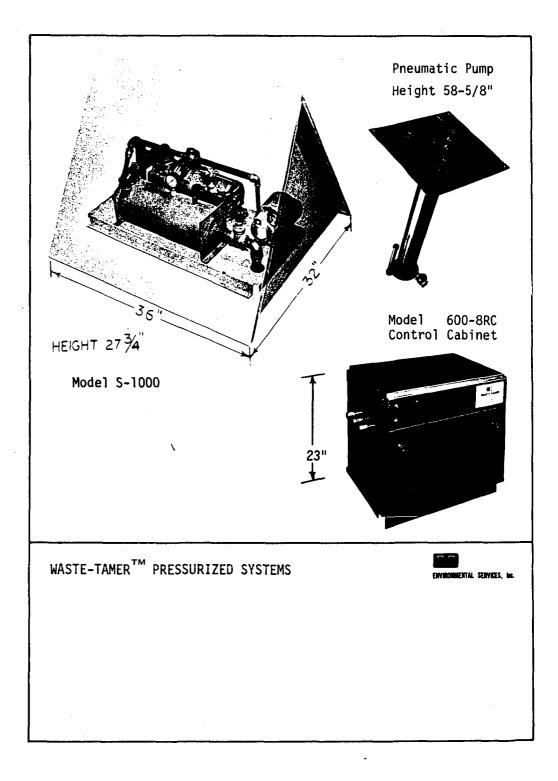






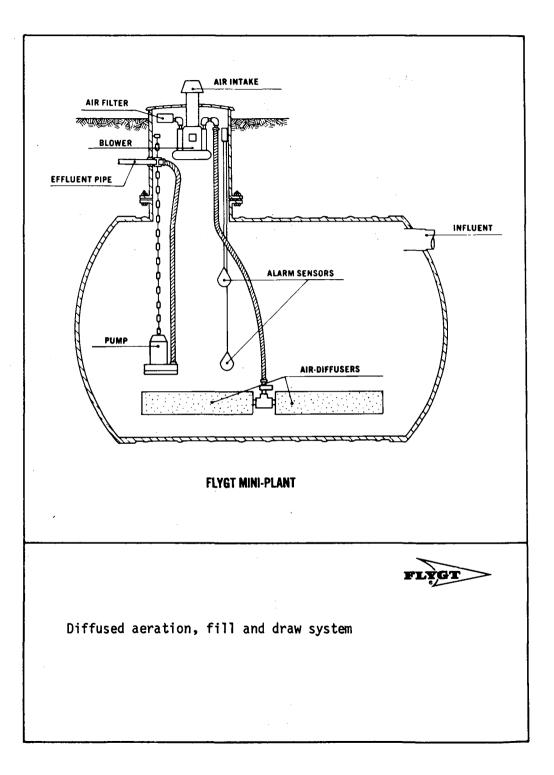


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| ver<br>2. Fil<br>(si<br>3. Bot<br>4. Fou<br>Mod<br>1.  <br>2. | indric<br>sions.<br>ter bai<br>milar<br>h comp<br>in mode<br>lel C-5<br>No fill<br>Has po | g in fin<br>to tric!<br>artment:<br>1-sizes<br>ter bag<br>sitive ' | glass a<br>hal comp<br>ling fi<br>offer<br>availab | artment<br>lter) a<br>diffuse<br>le.<br>fe" fea   | tank, on<br>allows b<br>nd solids<br>d aeratio<br>ture1f<br>d. | iological<br>removal.<br>n. | treatr        | ent                  | 2. Superna<br>through<br>3. Treated<br>Model C<br>1. Infli | t enters fi<br>tant flows<br>round filt<br>effluent l<br>-5<br>uent enters<br>nd chamber, | els<br>rst compartm<br>into second<br>er bag.<br>eaves second<br>. comminution | ent, is aera<br>chamber, is<br>chamber the<br>chamber and<br>to settling | LTER BAG UN<br>sted, sludge s<br>aerated and p<br>rough discharg<br>d is aerated o<br>g chamber from | ettles<br>basses<br>ge. |
|                                                               |                                                                                           | DIMENSIO                                                           | NE                                                 |                                                   |                                                                |                             | 1             | COSTS (DO            |                                                            |                                                                                           |                                                                                |                                                                          | T I                                                                                                  |                         |
| NODEL<br>UMBER<br>MAJORI                                      | LENGTH                                                                                    | WIDTH                                                              | HEIGHT                                             | WEIGHT                                            | RATED<br>CAPACITY<br>(GPD)                                     | TANK<br>CAPACITY<br>(GAL.)  | SUGG. LI      | INSTA                | LL OPERATE                                                 | DESIGN<br>LIFETIME<br>(VRL) 2                                                             | ELECTRICITY<br>(RATING)                                                        |                                                                          | OPERATING<br>SUPPLIES                                                                                |                         |
| CA-610                                                        | 70"                                                                                       | round                                                              | 70"                                                | 280                                               | 500                                                            | 500                         | 995           |                      | See<br>below                                               | Filter:<br>5-10 yr.<br>Motor: 10+                                                         | 110/440<br>V AC                                                                |                                                                          | Only if<br>disinfect<br>required                                                                     |                         |
| CA-900                                                        | 8'                                                                                        | cyl                                                                | 5'                                                 |                                                   | 900                                                            | 900                         | 1 195         |                      | п                                                          | н                                                                                         | r                                                                              |                                                                          |                                                                                                      |                         |
| C-5                                                           | 8'                                                                                        | cy1                                                                | 5'                                                 | 437                                               | 480                                                            | 900                         | 1195          |                      |                                                            | pumps<br>1-5 yrs.                                                                         |                                                                                |                                                                          | "                                                                                                    |                         |
| -1510                                                         | 10'6"                                                                                     | 5*                                                                 | 70"                                                | 638                                               | 1500                                                           | 1 500                       | 2500-<br>3000 |                      |                                                            |                                                                                           |                                                                                |                                                                          |                                                                                                      |                         |
|                                                               | es or 1                                                                                   | bearing                                                            | (no la                                             | bor cha                                           |                                                                | nor charg                   | e for n       | 6 <b>M</b>           | 2. Change o                                                | carbon vane                                                                               | s every nine                                                                   | months to t                                                              | two years.                                                                                           |                         |
| ADDEL<br>UNIBER<br>NAJORI                                     | (R -                                                                                      |                                                                    | DO CO                                              | CTUAL V                                           |                                                                | OPERATI<br>RANGES           | 8             | NOISE<br>A<br>ODORS  | STANDARD                                                   |                                                                                           |                                                                                |                                                                          |                                                                                                      |                         |
| A-610                                                         | 85-3<br>95                                                                                |                                                                    |                                                    |                                                   |                                                                | Unlimit                     |               | o odors <sup>5</sup> |                                                            | J;                                                                                        |                                                                                |                                                                          |                                                                                                      |                         |
| A-900                                                         |                                                                                           |                                                                    |                                                    |                                                   |                                                                |                             |               |                      |                                                            |                                                                                           |                                                                                |                                                                          |                                                                                                      |                         |
| C-5                                                           | "                                                                                         |                                                                    |                                                    |                                                   |                                                                | "                           |               | o odors<br>no nofse  |                                                            |                                                                                           |                                                                                |                                                                          |                                                                                                      |                         |
| - 1510 1                                                      |                                                                                           |                                                                    |                                                    |                                                   |                                                                |                             | 1             |                      |                                                            |                                                                                           |                                                                                |                                                                          |                                                                                                      |                         |
|                                                               | Ļ                                                                                         |                                                                    | í                                                  |                                                   | 11                                                             |                             |               |                      | 1                                                          |                                                                                           | 5                                                                              |                                                                          |                                                                                                      |                         |
|                                                               | <sup>3</sup> Based                                                                        | 1 on 500<br>naglass                                                | í<br>GPD fl<br>Perform                             | ow.<br>ance Da                                    | ta bookle                                                      | 4 <sub>Ta</sub>             | nk shou       | ld be in             | sulated in Ai                                              | rctic cold.                                                                               | 5 <sub>Possible</sub>                                                          | noise can t                                                              | e easily insu                                                                                        | lated.                  |
| <ol> <li>One<br/>fib</li> <li>Nat</li> </ol>                  | <sup>3</sup> Based<br>(Cror<br>NTIES,<br>year v<br>erglass<br>ional,                      | aglass<br>GUARA<br>varranty<br>tank a<br>Interna                   | Perform<br>NTEES,<br>on all<br>nd plas             | ance Da<br>B SERV<br>moving<br>tic par<br>factor; | ICE<br>parts, u                                                | nlimited                    | warrant       |                      | TECHNICAL<br>1. Testing<br>Michigan                        | PERFORMA<br>is present<br>1, on the C                                                     | ANCE<br>ly being per<br>A-610 and CA<br>and new item                           | formed at NS<br>-900.<br>In the Cror                                     | ie easily insu<br>iF, Ann Arbor,<br>maglass line.<br>Nov. 24, 1977                                   |                         |

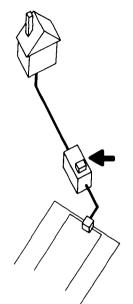


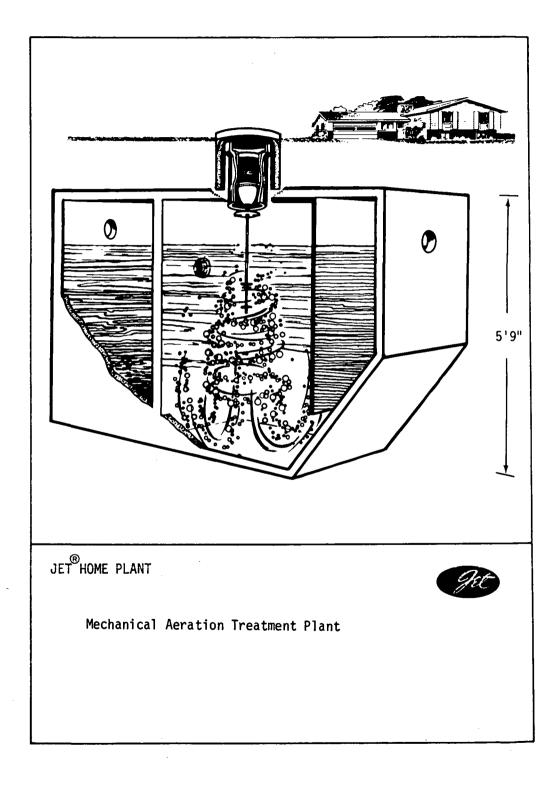
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|                                                                                                                           | RANITE<br>IDLANI<br>01) 652                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | AND<br>D PARI<br>-3332                                                                                  | FAL SER<br>WEST ST<br>K, NEW J<br>Fred C. Jo                                                   | ERSEY                                              | 07432                                                                | atment Div                                                                            | ision                                                                                                  |                                                      |                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                            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PRESSUR                                                                                                                                                                                                                                                                                   | ASTE-T<br>Re-CHAMBI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| set<br>2. S-1<br>A-f<br>e.g<br>3. Con<br>cor<br>4. Ins                                                                    | ti-comp<br>tling,<br>000 and<br>rame st<br>., hous<br>trol ur<br>rosion)<br>tead of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | oxygen<br>LS-150<br>melter;<br>me, gar<br>mit con<br>singl                                              | ation, f<br>O contro<br>600-8RC<br>age.<br>sists of<br>e tank.                                 | inal se<br>1 units<br>contro<br>compres<br>can use | ttling.<br>mounted<br>l unit mo<br>ssor and                          | aler) prov<br>on top of<br>unted rema<br>pumps (pro<br>n series.<br>system.           | tank in<br>otely,<br>otected (                                                                         | irom                                                 | into pri<br>higher-<br>2. Pumps mu                                                                                                                                               | unit work<br>essure char<br>than-atmos<br>ove 30 tim<br>e chambers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | s by pumping sem<br>mbers where air<br>pheric pressure.<br>es the contents<br>per day, thorou                                                                                                                                                                                             | is pumped<br>of the tan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | into fluid<br>nks through                                                    | at<br>the |
|                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                        | 1         |
| MODEL<br>MUNIEER<br>(MAJOR)                                                                                               | LENGTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | WIDTH                                                                                                   | HEIGHT                                                                                         | WEIGHT.<br>(LB.)                                   | RATED<br>CAPACITY<br>(GPD)                                           | TANK<br>CAPACITY<br>(GAL.)                                                            | SUGG, LIS<br>(FOB<br>FACTORY                                                                           | INETA                                                |                                                                                                                                                                                  | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ELECTRICITY<br>(RATING)                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                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                                        |           |
| -1000                                                                                                                     | L×                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ₩ × H<br>160                                                                                            |                                                                                                | 135<br>ship'g                                      | 600                                                                  | 1200 to<br>1500                                                                       | 700.                                                                                                   | 750-<br>100                                          |                                                                                                                                                                                  | 10 year<br>min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 115 V; 1<br>ph; 60 Hz;<br>7.9 amp                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                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| -1500                                                                                                                     | Lx                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 400 × H                                                                                                 | ft. <sup>3</sup>                                                                               | 165<br>shipʻg                                      | 1500                                                                 | 3000                                                                                  | 900.                                                                                                   | ·                                                    |                                                                                                                                                                                  | "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 115 V; 1<br>ph; 60 Hz;<br>9.9 amp<br>115 V; 1                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                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                                        | <b> </b>  |
| 600-8RC                                                                                                                   | L ×                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | N X H<br>160                                                                                            | ft. <sup>3</sup>                                                                               | 250<br>ship'g                                      | 600                                                                  | 1200                                                                                  | 762.                                                                                                   | •                                                    |                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ph; 60 Hz;<br>6.0 amp                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                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| 1. Ave                                                                                                                    | rage pa<br>00 (tot                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ckage                                                                                                   | <b>TENTIA</b><br>Installa                                                                      |                                                    | ave been                                                             | between \$                                                                            | 1400 and                                                                                               |                                                      | control<br>3. S-model:<br>4. Septic<br>OPERATION<br>1. Quarter                                                                                                                   | cal work.<br>requires<br>box.<br>s require<br>tank insta<br>& MAINTE<br>ly checks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | for electric                                                                 |           |
| 1. Ave<br>\$18                                                                                                            | 00 ( tot                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ckage<br>al).                                                                                           | fnstal]a                                                                                       | tions ha                                           |                                                                      |                                                                                       | <u> </u>                                                                                               |                                                      | 1. Electri<br>2. 600-8RC<br>control<br>3. S-model:<br>4. Septic<br>OPERATION<br>1. Quarter<br>2. No ski?                                                                         | cal work.<br>requires<br>box.<br>s require  <br>tank insta<br>& MAINTE<br>ly checks<br>l required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                  | for electric                                                                 |           |
| 1. Ave<br>\$18<br>MODEL<br>NUMBER                                                                                         | 00 ( tot                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ckage<br>a1).<br>NICAL PI                                                                               |                                                                                                | tions he<br>CE-OUTPL<br>CTUAL V                    | л                                                                    | OPERATIN<br>RANGES<br>(TEMP, OTH                                                      | eG III                                                                                                 |                                                      | 1. Electric<br>2. 600-8RC<br>control<br>3. S-model:<br>4. Septic<br>OPERATION<br>1. Quarter                                                                                      | cal work.<br>requires<br>box.<br>s requires<br>tank insta<br><b>&amp; MAINTE</b><br>ly checks<br>l required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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                                                                                                               | for electric                                                                 |           |
| MODEL<br>MODEL<br>MODEL<br>MAJORI                                                                                         | 00 (tot<br>TECH<br>(R - 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ckage<br>a1).<br>NICAL PI<br>& REDUC                                                                    | Installa<br>ERFORMAN<br>TION, A - A                                                            | tions he<br>CE-OUTPL<br>CTUAL V                    | л                                                                    | OPE RATIN<br>RANGES                                                                   | era)<br>Era)<br>5° F not                                                                               | NOISE<br>B.<br>DOORS                                 | 1. Electrin<br>2. 600-8RC<br>control<br>3. S-model:<br>4. Septic<br><b>OPERATION</b><br>1. Quarter<br>2. No ski!                                                                 | cal work.<br>requires<br>box.<br>s require  <br>tank insta<br>& MAINTE<br>ly checks<br>l required<br>OTHI<br>Desig                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                          | for electric                                                                 | al.       |
| 1. Ave<br>\$18<br>WODEL<br>WUMBER<br>MAJORI                                                                               | 00 (tot<br>(R - 3<br>(R) 5<br>up to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ckage<br>a1).<br>NICAL PI<br>& REDUC                                                                    | Installa<br>ERFORMAN<br>TION, A - A                                                            | tions he<br>CE-OUTPL<br>CTUAL V                    | л                                                                    | OPERATIO<br>RANGES<br>(TEMP, OTH                                                      | era)<br>Era)<br>5° F not                                                                               | NOISE<br>A<br>DOORS<br>IOF<br>Se and                 | 1. Electri.<br>2. 600-8RC<br>control<br>3. S-model:<br>4. Septic<br>OPERATION<br>1. Quarter<br>2. No ski!<br>STANDARD                                                            | cal work.<br>requires<br>box.<br>s requires<br>s requires<br>tank insta<br>tank insta<br>tan | air piping work<br>protective shelt<br>llers can instal<br>INANCE REQUIR<br>for compressors<br>for operation.                                                                                                                                                                             | ter.<br>11 except f<br><b>EMENTS</b><br>and pumps.<br>BOD/day 1<br>BOD/day 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | for electric<br>load, 48 hou<br>1 by dealer.<br>bad, 48 hour                 | a].       |
| 1. Ave<br>\$18<br>MODEL<br>NUMBER<br>MAJORI<br>-1000<br>-1500                                                             | (R - 5<br>(R) 5<br>(B) 5 | ckage<br>a1).<br>NICAL PI<br>& REDUC                                                                    | Installa<br>ERFORMAN<br>TION, A - A                                                            | tions he<br>CE-OUTPL<br>CTUAL V                    | л                                                                    | OPERATIN<br>RANGES<br>(TEMP, OTH<br>-20° to 9                                         | era)<br>Era)<br>5° F not                                                                               | NOISE<br>A<br>DOORS<br>Nor<br>se and<br>odor         | 1. Electri.<br>2. 600-8RC<br>control<br>3. S-model:<br>4. Septic<br>OPERATION<br>1. Quarter<br>2. No ski!<br>STANDARD                                                            | cal work.<br>requires<br>bax.<br>s require tank instank insta<br>& MAINTE<br>& MAINTE<br>Tequired<br>Tequired<br>Desig<br>reten<br>Desig                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | air piping work<br>protective shelt<br>llers can instal<br>INANCE REQUIR<br>for compressors<br>for opperation.                                                                                                                                                                            | ter.<br>11 except f<br>tEMENTS<br>and pumps.<br>. BOD/day 1<br>bOD/day 10<br>. BOD/day 10<br>. BOD/day 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | for electric<br>load, 48 hou<br>i by dealer.<br>bad, 48 hour                 | a].       |
| 1. Ave<br>\$18<br>NUMBER<br>(MAJOR)<br>5-1000                                                                             | 00 (tot<br>(R - 9<br>(R) 5<br>(R) to<br>95<br>"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ckage<br>a1).<br>NICAL PI<br>& REDUC                                                                    | Installa<br>ERFORMAN<br>TION, A - A                                                            | tions he<br>CE-OUTPL<br>CTUAL V                    | л                                                                    | OPERATI<br>RANGES<br>(TEMP, OTH<br>-20" to 99                                         | era)<br>Era)<br>5° F not                                                                               | NOISE<br>a<br>DOORS<br>NOT<br>Se and<br>odor<br>"    | 1. Electri.<br>2. 600-8RC<br>control<br>3. S-model:<br>4. Septic<br>OPERATION<br>1. Quarter<br>2. No ski!<br>STANDARD                                                            | cal work.<br>requires<br>bax.<br>s require tank instank insta<br>& MAINTE<br>& MAINTE<br>Tequired<br>Tequired<br>Desig<br>reten<br>Desig                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | air piping work<br>protective shelt<br>llers can instal<br>NANCE REQUIR<br>for compressors<br>for operation.<br>ER<br>ned for 2.21 lb.<br>tion, tank to be<br>ned for 3.3 lb.<br>tion.<br>ned for 1.36 lb.                                                                                | ter.<br>11 except f<br>tEMENTS<br>and pumps.<br>. BOD/day 1<br>bOD/day 10<br>. BOD/day 10<br>. BOD/day 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | for electric<br>load, 48 hou<br>i by dealer.<br>bad, 48 hour                 | a].       |
| \$18<br>MODEL<br>NUMBER<br>(MAJOR)<br>5-1000<br>5-1500<br>500-8RC<br>500-8RC<br>500-8RC<br>1 y a<br>1 y<br>3 Ren<br>a y y | TECHOR<br>(R - 3<br>POP<br>UP to<br>95<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ckage<br>al).<br>NICAL PI<br>REOUC<br>SS<br>SUARA<br>ranty r<br>Ius lai<br>service<br>service<br>e emer | Installa<br>TION A - A<br>DO CC<br>INTEES, i<br>On parts<br>Dor for<br>olicy in<br>e policy in | CEOUTRY<br>CTUALV<br>NO<br>GESERV<br>and wo        | ICE<br>ICE<br>Image: Second<br>In sale p<br>s: routine<br>s: routine | OPERATIN<br>RANGES<br>(TEMP, OT<br>-20° to 9!<br><br><br><br>; replaces<br>; replaces | eg<br>(FR) Mir<br>s° F no<br>no<br>no<br>no<br>no<br>no<br>no<br>no<br>no<br>no<br>no<br>no<br>no<br>n | NOISE<br>A<br>XDORS<br>Se and<br>odor<br>"<br>"<br>" | 1. Electric<br>2. 600-80<br>2. 600-80<br>3. S-model:<br>4. Septic<br>OPERATION<br>1. Quarter<br>2. No ski!<br>STANDARDE<br>CODES MET<br>See below<br>TECHNICAL<br>1. Have become | cal work.<br>requires<br>box.<br>s requires<br>tank insta<br>de MAINTE<br>de MAINTE<br>de MAINTE<br>de MAINTE<br>de Mainte<br>de Mainte<br>de Mainte<br>de Sesigne<br>reten<br>Designe<br>reten<br>Designe<br>reten<br>Designe<br>reten<br>Designe<br>reten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | air piping work<br>protective shelt<br>llers can instal<br>NANCE REQUIR<br>for compressors<br>for operation.<br>ER<br>ned for 2.21 lb.<br>tion, tank to be<br>ned for 3.3 lb.<br>tion, tank to be<br>ned for 1.36 lb.<br>tion, tank to be<br>ANCE<br>d in Pennsylvani<br>C. Hess, Associa | ter.<br>11 except f<br><b>IEMENTS</b><br>and pumps.<br>. BOD/day 1<br>e furnished<br>BOD/day 1o<br>. BOD/day 10<br>. BOD/ | for electric<br>load, 48 hou<br>i by dealer.<br>load, 48 hou<br>d by dealer. | al.       |



| 12                                                                                                         | 03) 846                                                                                                                                   | 2051                                                                                                     |                                                                                                       | TICUT 06<br>S. LaVall                                                                 |                                                                                               | Manager, F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Residential                                                                                                    | System                                     | 5                                                                                                                                                                                                                            |                                                                                                                       |                                                                                                                                           | FLYGT                                                                                                    |                                                                     | )  |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|----|
| "pu<br>2. Foa<br>3. Acc<br>wit<br>4. Lev<br>5. Ata                                                         | ch trea<br>imping o<br>im plas<br>idge.<br>cessway<br>ch conci<br>rel sen<br>irm ligi                                                     | compor<br>rete ta<br>ors op<br>its inc                                                                   | super<br>diffi<br>int w<br>ink or<br>ierate<br>licate                                                 | rnatant (<br>user aera<br>ith basic<br>fibergla<br>pumping<br>malfunct                | fill and o<br>tes wasten<br>system for<br>uss contai<br>ignition<br>ions.                     | treatment<br>craw syste<br>water and<br>unctions c<br>ner.<br>and stoppi<br>air for di                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | m).<br>breaks up<br>an be sol<br>ng.                                                                           | htìy                                       | mixing<br>2. After t<br>mentati<br>3. After s<br>superna<br>4. Pump st<br>water 1                                                                                                                                            | circulates<br>all day an<br>imed mixin<br>on and set<br>ettling, t<br>tant is pu<br>arts and s<br>evels.              | air through<br>d evening (14<br>g, timer stor<br>ling cycle.<br>imer activate<br>rped out.<br>tops by level<br>cle is renewe              | 4-20 hours).<br>os blower, a<br>es pump (1/2<br>E sensors ac                                             | llows 3 hour<br>hour) and c<br>tivated at p                         | 1. |
|                                                                                                            |                                                                                                                                           | MENSH                                                                                                    |                                                                                                       |                                                                                       | ·····                                                                                         | T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                |                                            |                                                                                                                                                                                                                              | <b>,</b>                                                                                                              | T                                                                                                                                         |                                                                                                          | T                                                                   | -  |
| MODEL<br>NUMBER                                                                                            |                                                                                                                                           | T                                                                                                        | 1                                                                                                     | WEIGH                                                                                 | CAPACITY                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | SUGG. LIST                                                                                                     | INSTAL                                     |                                                                                                                                                                                                                              | DESIGN                                                                                                                | ELECTRICITY                                                                                                                               |                                                                                                          | OPERATING<br>SUPPLIES                                               | 1  |
| (MAJOR)                                                                                                    | LENGTH                                                                                                                                    | WOTH                                                                                                     | HEK                                                                                                   | нт (СС.)                                                                              | (GPD)<br>400-500                                                                              | (GAL.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (FOB<br>FACTORY)                                                                                               | COST                                       | COST                                                                                                                                                                                                                         | (YRS.)                                                                                                                | (RATING)                                                                                                                                  | ļ                                                                                                        | BUTTLIES                                                            |    |
| 4291                                                                                                       | See s                                                                                                                                     | izing                                                                                                    | 8 grov                                                                                                | rth                                                                                   | depending<br>on tank                                                                          | See<br>Sizing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1200-1                                                                                                         | Costs<br>below                             | 30-60/<br>year                                                                                                                                                                                                               | 25-30                                                                                                                 | 230 V AC <sup>2</sup><br>1 ph                                                                                                             |                                                                                                          | None                                                                | -  |
|                                                                                                            |                                                                                                                                           | h ore-                                                                                                   |                                                                                                       |                                                                                       |                                                                                               | iberglass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | tank,                                                                                                          |                                            |                                                                                                                                                                                                                              |                                                                                                                       | <sup>2</sup> 115 V AC a<br>recommende                                                                                                     | lso availab                                                                                              | le but 230 ¥                                                        | -  |
| 2. Exc                                                                                                     | ava<br>& GROM<br>k capac<br>crete t<br>ess cap                                                                                            | ilable<br><b>VTH PC</b><br>ity ad<br>ank an<br>acity                                                     | from<br><b>TENT</b><br>aptable<br>d manw<br>for up                                                    | e to loc<br>way compo<br>to 48 h                                                      | al regulat<br>nents.<br>ours colle                                                            | tions by u<br>ection of s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | was tewa te                                                                                                    | r.                                         | concret<br>2. Certifi<br>3. Manway:<br>PERATION                                                                                                                                                                              | Ion for se<br>e box (exa<br>ed electri<br>2" (minin<br>& MAINTE                                                       |                                                                                                                                           | e unit, gra<br>not required<br>ect electric<br>round to avo<br>UIREMENTS                                 | ).<br>al component:<br>id flooding.                                 | 5  |
| 1. Tan<br>con<br>2. Exc<br>COSTS<br>1. Ins<br>tio<br>2. Ope<br>14-                                         | ava<br>& GROM<br>k capac<br>crete t<br>ess cap<br>tallati<br>n costs<br>rating<br>20 hrs.<br>ional d                                      | ilable<br><b>VTH PC</b><br>ity ad<br>ank an<br>acity<br>on cos<br>costs:<br>/day.<br>isinfe              | from<br>DTENT<br>aptabl<br>d marw<br>for up<br>ts sli<br>600<br>ction<br>ERFORM                       | TAL<br>e to loc<br>ay compo<br>to 48 h<br>ghtly hi<br>W pump 1<br>at addit            | al regulat<br>nents.<br>ours colle<br>gher than<br>0-15 min./<br>ional cost                   | tions by u<br>action of s<br>septic ta<br>(day and 3<br>t (iodine                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | wastewate<br>nk instal<br>75 W blow<br>feeder).                                                                | r.<br>Ta-                                  | 1. Excavat<br>concret<br>2. Certifi<br>3. Manway:<br>PERATION<br>1. Now-and<br>require                                                                                                                                       | Ion for se<br>e box (exa<br>ed electri,<br>2" (minin<br>& MAINTE<br>-then obse<br>d.<br>two times                     | REMENTS<br>otic tank-lik<br>ct leveling r<br>cian to conne<br>num) above gr<br>NANCE REQI                                                 | te unit, gra<br>not required<br>ect electric.<br>round to avo<br>UIREMENTS<br>tem warning                | ).<br>al components<br>id flooding.<br>lights by ou                 | 5  |
| 1. Tan<br>con<br>2. Exc<br>COSTS<br>1. Ins<br>tio<br>2. Ope<br>14-<br>3. Opt                               | ava<br>& GROM<br>k capac<br>crete t<br>ess cap<br>tallati<br>n costs<br>rating<br>20 hrs.<br>ional d                                      | ilable<br>VTH PC<br>ity ad<br>ank an<br>acity<br>on cos<br>costs:<br>/day.<br>isinfe<br>NICALPC          | from<br>DTENT<br>aptabl<br>d marw<br>for up<br>ts sli<br>600<br>ction<br>ERFORM                       | TAL<br>e to loc<br>vay compo<br>b to 48 h<br>ghtly hi<br>W pump l<br>at addit         | al regulat<br>nents.<br>ours colle<br>gher than<br>0-15 min./<br>ional cost                   | tions by u<br>action of s<br>septic ta<br>(day and 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | wastewate<br>nk instal<br>75 W blow<br>feeder).                                                                | r.<br>1a- 0                                | 1. Excavat<br>concret<br>2. Certifi<br>3. Manway:<br>PERATION<br>1. Now-and<br>require:<br>2. One or<br>STANDARD<br>&<br>CODES MET                                                                                           | ton for se<br>e box (exa<br>ed electri<br>2" (minin<br>& MAINTE<br>-then obse<br>d.<br>two times of<br>s              | REMENTS<br>otic tank-lik<br>ti leveling r<br>cian to conne<br>num) above gr<br>NANCE REQU<br>rvance of sys                                | te unit, gra<br>not required<br>ect electric.<br>round to avo<br>UIREMENTS<br>tem warning                | ).<br>al components<br>id flooding.<br>lights by ou                 | 5  |
| 1. Tan<br>con<br>2. Exc<br>COSTS<br>1. Ins<br>tio<br>2. Ope<br>14-<br>3. Opt<br>NUMBER                     | ava<br>& GROM<br>k capac<br>crete t<br>ess cap<br>tallatin<br>costs<br>rating<br>20 hrs.<br>ional d<br>TECH<br>(R - 1)                    | ilable<br>VTH PC<br>ity ad<br>ank an<br>acity<br>on cos<br>costs:<br>/day.<br>isinfe<br>NICAL P<br>REDUC | from<br>TENT<br>aptabl<br>d manw<br>for up<br>ts sli<br>600<br>ction<br>ERFORM<br>TION, A             | AL<br>e to loc<br>ray compo<br>to 48 h<br>ghtly hi<br>W pump 1<br>at addit<br>-ACTUAL | al regulat<br>nents.<br>ours colle<br>gher than<br>0-15 min./<br>ional cost                   | ctions by u<br>ection of f<br>septic ta<br>(day and 3<br>: (iodine<br>OPERATH<br>BANGES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | wastewate<br>nk instal<br>75 W blow<br>feeder).<br>NG N<br>16R3 G<br>on<br>annoi                               | r.<br>Ta-<br>er<br>Noise                   | 1. Excavat<br>concret<br>2. Certifi<br>3. Manway:<br><b>PERATION</b><br>1. Now-and<br>require<br>2. One or<br><b>STANDARD</b>                                                                                                | Ion for se<br>e box (exa<br>ed electri<br>2" (minin<br>& MAINTE<br>-then obse<br>d.<br>two times .<br>s<br>of<br>uro- | REMENTS<br>otic tank-lik<br>ti leveling r<br>cian to conne<br>num) above gr<br>NANCE REQU<br>rvance of sys                                | te unit, gra<br>not required<br>ect electric.<br>round to avo<br>UIREMENTS<br>tem warning                | ).<br>al components<br>id flooding.<br>lights by ou                 | 5  |
| 1. Tan<br>cor<br>2. Exc<br>COSTS<br>1. Ins<br>tio<br>2. Ope<br>14-<br>3. Opt<br>MODEL<br>MUMBER<br>(MAJOR) | ava<br><b>B</b> GROM<br>k capac<br>crete t<br>ess cap<br>tallati<br>n costs<br>rating<br>20 hrs.<br>ional d<br>TECH<br>(M-1<br>BOD<br>(M) | ilable<br>VTH PC<br>ity ad<br>ank an<br>acity<br>on cos<br>costs:<br>/day.<br>isinfe<br>NICAL P<br>REDUC | from<br>DTENT<br>aptabl<br>d mamm<br>for up<br>ts sli<br>600<br>ction<br>ERFORM<br>TION, A<br>PO<br>A | AL<br>e to loc<br>ray compo<br>to 48 h<br>ghtly hi<br>W pump 1<br>at addit<br>-ACTUAL | al regulation nents.<br>ours colle<br>gher than<br>0-15 min./<br>tional cost<br>Pur<br>VALUE; | tions by u<br>ection of section of s | wastewate<br>nk instal<br>75 W blow<br>feeder).<br>NG N<br>ieen C<br>d<br>min<br>noi<br>noi<br>noi<br>in Arcti | r.<br>la-<br>er<br>boos<br>se and<br>odors | <ol> <li>Excavat<br/>concrete<br/>2. Certifi<br/>3. Manway:<br/><b>PERATION</b></li> <li>Now-and<br/>require<br/>2. One or</li> <li>StanDaRD<br/>coDES MET</li> <li>Nor- Univ.<br/>Wisc. 4 &amp; E<br/>pean testi</li> </ol> | lon for see<br>box (exa ebox (exa ebox (exa ebox (exa ebox (exa ebox (exa ebox ebox ebox ebox ebox ebox ebox ebox     | REMENTS<br>Dii Lank-lik<br>i leveling r<br>Sian to come<br>num) above gen<br>NANCE REOL<br>vance of sys<br>s year have u<br>sing by NSF ( | te unit, gra<br>not required<br>tot electric.<br>ound to avo<br>UIREMENTS<br>tem warning<br>unit checked | ).<br>al component:<br>id flooding.<br>lights by ou<br>and sludge p | 5  |

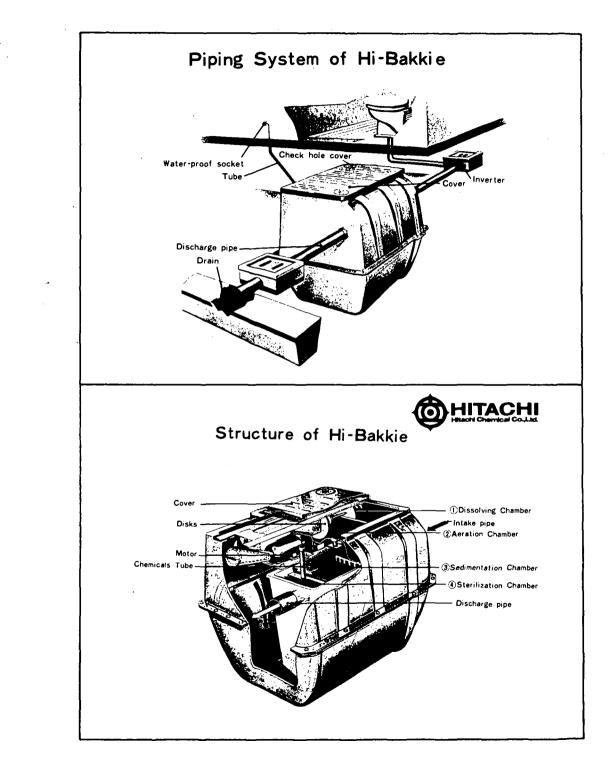




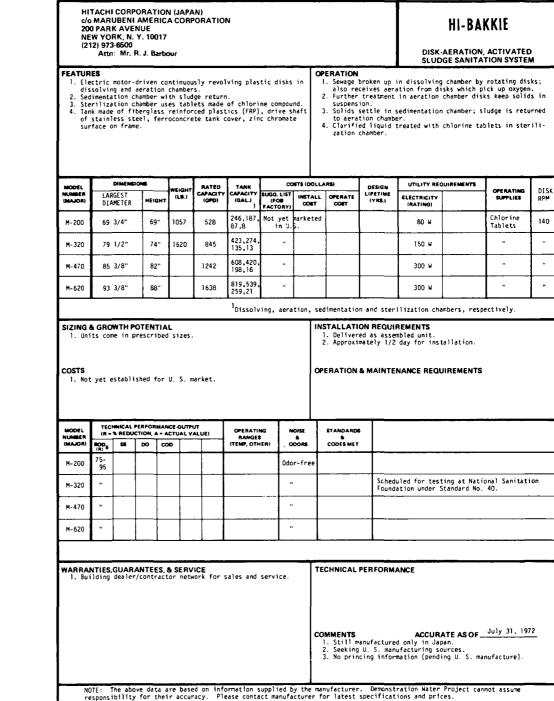
| 3. Ex                                                                                            | tensive<br>rning 1                                                                            | ight ir                                                                               | e and wa<br>dicates                                                                     | rranty<br>mechani                                                                | possibili<br>cal break                                                      | ities.<br>«down of a                                                                                |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | chamber<br>4. Effluer                                                                                                            | •.                                                                                                                     | ows under ba<br>slide down<br>er weir to d                         | ischarge.                           | e to aero |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------|-----------|
| MODEL<br>NUMBER<br>(MAJOR)                                                                       | LENGTI                                                                                        | WIDTH                                                                                 | i                                                                                       | WEIGHT<br>(LB.)                                                                  | RATED<br>CAPACITY<br>(GPD)                                                  | TANK<br>CAPACITY<br>(GAL.)                                                                          | SUGG, LIST                                                                                                            | INSTALL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                  | OESIGN<br>LIFETIME<br>(YRS.)                                                                                           | ELECTRICITY                                                        |                                     | OPERAT    |
| Home<br>Plant<br>(J-135)                                                                         | 9'8"                                                                                          | 4'9"                                                                                  | 5'9"                                                                                    |                                                                                  | 600                                                                         | 1200                                                                                                | 575.                                                                                                                  | coarr<br>ca 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 20-30/<br>year                                                                                                                   | 20-25 on<br>mechanica<br>equipment                                                                                     | (RATING)                                                           |                                     | Non       |
|                                                                                                  |                                                                                               | ļ                                                                                     |                                                                                         |                                                                                  |                                                                             |                                                                                                     |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                  |                                                                                                                        |                                                                    |                                     | [         |
|                                                                                                  |                                                                                               | -                                                                                     | $\left  \right $                                                                        |                                                                                  |                                                                             |                                                                                                     |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                  |                                                                                                                        |                                                                    |                                     |           |
|                                                                                                  | L                                                                                             | J                                                                                     |                                                                                         |                                                                                  | Ļ                                                                           | ation port                                                                                          | l                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                  | L                                                                                                                      | L                                                                  | <sup>2</sup> Unless chl             |           |
| ac<br>COSTS<br>1. Af                                                                             | chanica<br>commoda<br>ter 2 y                                                                 | te larg                                                                               | er deman<br>ee servi                                                                    | e set 1<br>d on sy<br>ce, ext                                                    | for longen<br>ystem.<br>tended sen                                          | r aeration<br>rvice cont                                                                            | racts are                                                                                                             | o                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | electr<br>2. Gravel<br>PERATION<br>1. No main<br>2. Service                                                                      | ical hook-u<br>pad under<br><b>&amp; MAINTE</b><br>tenance by<br>policy ha                                             | p. No level<br>tank not req<br>NANCE REQ<br>owner,<br>s 6 month in | utred.<br>UIREMENTS                 | i.        |
| 2. Me<br>ac<br>COSTS<br>1. Af<br>av<br>2. Op<br>3. Sh<br>an                                      | chanica<br>commoda<br>ter 2 y<br>ailable<br>tional<br>ipping<br>d contr                       | rears fr<br>e, at \$2<br>chlorir<br>costs a<br>ol equi                                | er deman<br>ree servi<br>20-\$40/ye<br>ator cos<br>iverage \$<br>ipment is              | e set f<br>d on sy<br>ce, ext<br>ar.<br>ts \$80.<br>3 each<br>shippe<br>ceourpe  | for longer<br>/stem.<br>tended ser<br>. \$50/yea<br>to the di<br>ed, tank i | r aeration<br>rvice conf<br>ar operati<br>istributor<br>furnished<br>OPERATH                        | racts are<br>ing.<br>. (Aeral<br>by dealer                                                                            | oi<br>ion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | electr<br>2. Gravel<br>PERATION<br>1. No main<br>2. Service                                                                      | ical hook-u<br>pad under<br><b>&amp; MAINTE</b><br>itenance by<br>policy ha<br>ary for mai                             | p. No level<br>tank not req<br>NANCE REQ<br>owner,<br>s 6 month in | ing required<br>uired.<br>UIREMENTS | i.        |
| 2. Me<br>ac<br><b>COSTS</b><br>1. Af<br>av<br>2. Op<br>3. Sh<br>an                               | chanica<br>commoda<br>ter 2 y<br>ailable<br>tional<br>ipping<br>d contr                       | rears fr<br>e, at \$2<br>chlorir<br>costs a<br>ol equi                                | er deman<br>ee servi<br>0-\$40/ye<br>ator cos<br>iverage \$<br>ipment is                | e set f<br>d on sy<br>ce, ext<br>ar.<br>ts \$80.<br>3 each<br>shippe<br>ctual v. | for longer<br>/stem.<br>tended ser<br>. \$50/yea<br>to the di<br>ed, tank i | r aeration<br>rvice conf<br>ar operati<br>istributor<br>furnished                                   | racts are<br>ing.<br>. (Aeral<br>by dealer                                                                            | (ion<br>.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | electri<br>2. Gravel<br>PERATION<br>1. No main<br>2. Service<br>necessa<br>STANDARD<br>CODES MET                                 | ical hook-u<br>pad under<br><b>&amp; MAINTE</b><br><b>&amp; MAINTE</b><br>tenance by<br>policy ha<br>ary for main<br>f | p. No level<br>tank not req<br>NANCE REQ<br>owner,<br>s 6 month in | ing required<br>uired.<br>UIREMENTS | i.        |
| 2. Me<br>ac<br>COSTS<br>1. Af<br>av<br>2. Op<br>3. Sh<br>an                                      | chanica<br>commoda<br>ter 2 y<br>ailable<br>tional<br>ipping<br>d contr<br>(R -               | te larg<br>rears fr<br>a, at \$2<br>chlorir<br>costs a<br>rol equi<br><b>mical Pi</b> | er deman<br>ree servi<br>20-\$40/ye<br>ator cos<br>iverage \$<br>ipment is<br>ERFORMANN | e set f<br>d on sy<br>ce, ext<br>ar.<br>ts \$80.<br>3 each<br>shippe<br>ctual v. | for longer<br>/stem.<br>tended ser<br>. \$50/yea<br>to the di<br>ed, tank i | r aeration<br>rvice conf<br>ar operati<br>istributor<br>furnished<br>                               | racts are<br>ng.<br>(Aeral<br>by dealer<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is | Conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse | electri<br>2. Gravel<br>PERATION<br>1. No main<br>2. Service<br>necessor<br>standardo                                            | ical hook-u<br>pad under<br><b>&amp; MAINTE</b><br><b>&amp; MAINTE</b><br>tenance by<br>policy ha<br>ary for main<br>f | p. No level<br>tank not req<br>NANCE REQ<br>owner,<br>s 6 month in | ing required<br>uired.<br>UIREMENTS | i.        |
| 2. Me<br>ac<br>COSTS<br>1. Af<br>av<br>2. Op<br>3. Sh<br>an<br>NUMBER<br>NUMBER<br>Home<br>Plant | chanica<br>commoda<br>ter 2 y<br>ailable<br>tional<br>ipping<br>d contr<br>(R -<br>(R)<br>(R) | rears fr<br>at \$2<br>chlorir<br>costs a<br>col equi<br>inical Pl<br>means<br>(R)     | er deman<br>ree servi<br>20-\$40/ye<br>ator cos<br>iverage \$<br>ipment is<br>ERFORMANN | e set f<br>d on sy<br>ce, ext<br>ar.<br>ts \$80.<br>3 each<br>shippe<br>ctual v. | for longer<br>/stem.<br>tended ser<br>. \$50/yea<br>to the di<br>ed, tank i | r aeration<br>rvice conf<br>ar operati<br>istributor<br>furnished<br>OPERATH<br>RANGE<br>ITEMP, OTH | racts are<br>ng.<br>(Aeral<br>by dealer<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is | Conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse | electr<br>2. Gravel<br>PERATION<br>1. No main<br>2. Service<br>necessa<br>standardo<br>codes men<br>Eligible fin<br>Eligible fin | ical hook-u<br>pad under<br><b>&amp; MAINTE</b><br><b>&amp; MAINTE</b><br>tenance by<br>policy ha<br>ary for main<br>f | p. No level<br>tank not req<br>NANCE REQ<br>owner,<br>s 6 month in | ing required<br>uired.<br>UIREMENTS | i.        |
| 2. Me<br>ac<br>COSTS<br>1. Af<br>av<br>2. Op<br>3. Sh<br>an<br>NUMBER<br>NUMBER<br>Home<br>Plant | chanica<br>commoda<br>ter 2 y<br>ailable<br>tional<br>ipping<br>d contr<br>(R -<br>(R)<br>(R) | rears fr<br>at \$2<br>chlorir<br>costs a<br>col equi<br>inical Pl<br>means<br>(R)     | er deman<br>ree servi<br>20-\$40/ye<br>ator cos<br>iverage \$<br>ipment is<br>ERFORMANN | e set f<br>d on sy<br>ce, ext<br>ar.<br>ts \$80.<br>3 each<br>shippe<br>ctual v. | for longer<br>/stem.<br>tended ser<br>. \$50/yea<br>to the di<br>ed, tank i | r aeration<br>rvice conf<br>ar operati<br>istributor<br>furnished<br>OPERATH<br>RANGE<br>ITEMP, OTH | racts are<br>ng.<br>(Aeral<br>by dealer<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is<br>is | Conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>a<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse<br>conse | electr<br>2. Gravel<br>PERATION<br>1. No main<br>2. Service<br>necessa<br>standardo<br>codes men<br>Eligible fin<br>Eligible fin | ical hook-u<br>pad under<br><b>&amp; MAINTE</b><br><b>&amp; MAINTE</b><br>tenance by<br>policy ha<br>ary for main<br>f | p. No level<br>tank not req<br>NANCE REQ<br>owner,<br>s 6 month in | ing required<br>uired.<br>UIREMENTS | i.        |

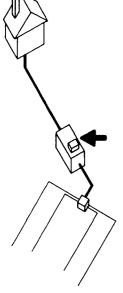
NOTE: The above data are based on information supplied by the manufacturer. Demonstration Water Project cannot assume responsibility for their accuracy. Please contact manufacturer for latest specifications and prices.

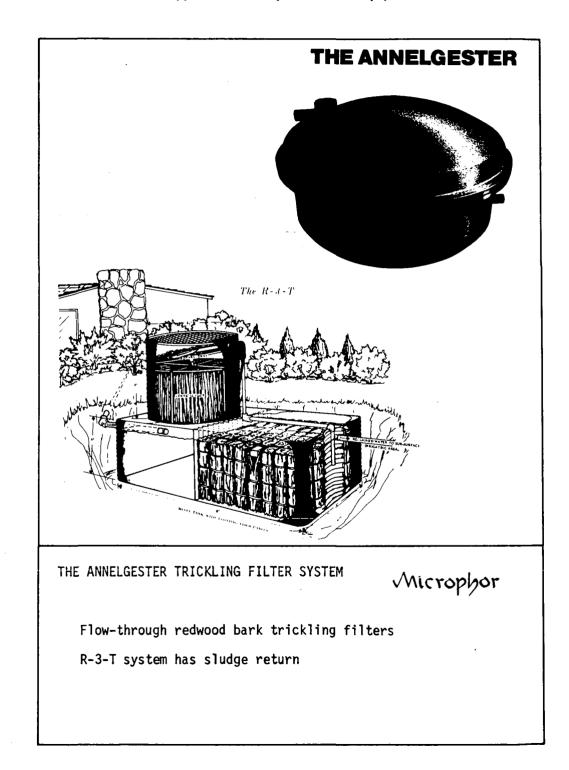
V



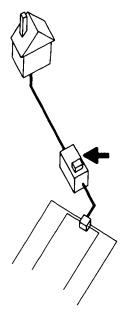
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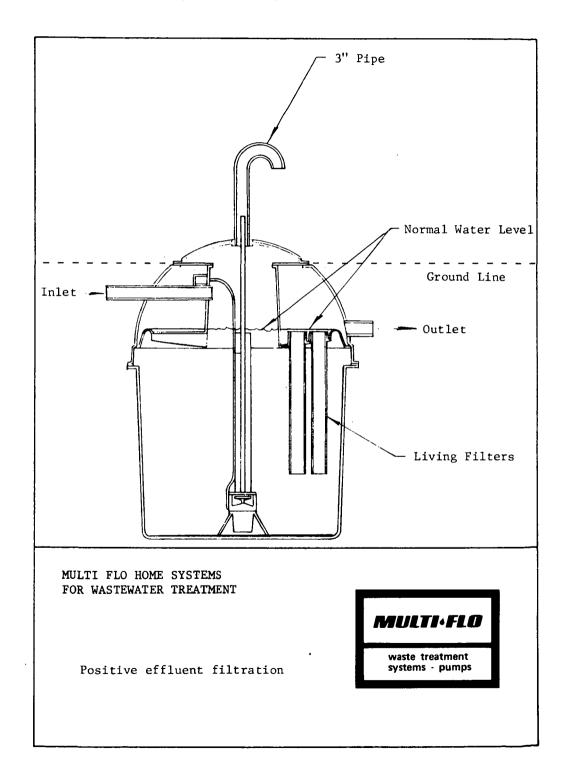




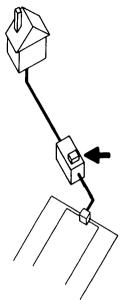


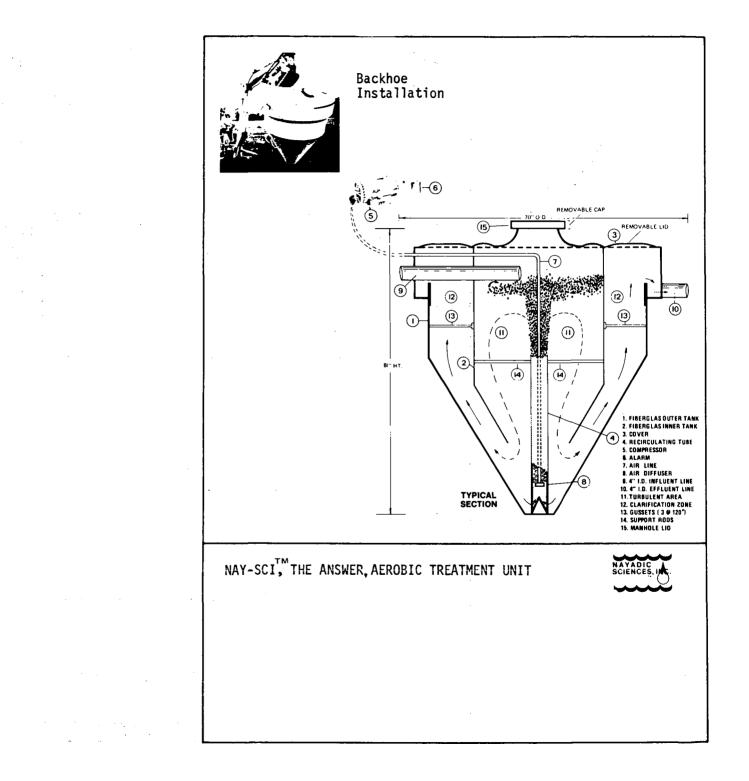
|                                                                                                       | Attn:                                                                  | MIT. JO                                                                               | nn wayi                                                     | IEHO, C.X.                                                                             | ec. Vice-Pi                                          | resident                                                                               |                      |                                                                     |                                                                                                                  |                                                                                                      | REDWO                                                                                                   | OD TRICKLI                                                  | NG FILTER             | UN |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------|----|
| 2. Tr<br>bai<br>dig<br>3. Cia                                                                         | ow-thron<br>ickling<br>rk on wi<br>gestion<br>rcular a                 | filter<br>hich bad<br>and rec                                                         | process<br>sterial                                          | uses a<br>slimes<br>-shaped                                                            | it contai<br>ir circul<br>form and<br>plastic<br>ls. | ation pas<br>produce t                                                                 | st redwo<br>biblogio | ood<br>cal                                                          | <ol> <li>Filteri<br/>organic</li> <li>Wastewa</li> </ol>                                                         | ng acts as<br>slimes.<br>ter and so                                                                  | biological                                                                                              | bark and is t<br>trickling of<br>olids are dis              | wastes past           |    |
|                                                                                                       |                                                                        | DIMENSIO                                                                              |                                                             |                                                                                        |                                                      |                                                                                        | <b>-</b>             | COSTS (DO)                                                          |                                                                                                                  |                                                                                                      | 1001117.85                                                                                              |                                                             | ·                     | 7  |
| MODEL<br>NUMBER<br>(MAJOR)                                                                            | LENGTH                                                                 | 1                                                                                     | HEIGHT                                                      | WEIGHT<br>(LØ.)                                                                        | RATED<br>CAPACITY<br>(GPD)                           | TANK<br>CAPACITY<br>(GAL.)                                                             | SUGG. LI             |                                                                     |                                                                                                                  | DESIGN<br>LIFETIME<br>(YRS.)                                                                         | ELECTRICITY<br>(RATING)                                                                                 |                                                             | OPERATING<br>SUPPLIES |    |
| D-750                                                                                                 | 6'3"                                                                   | round                                                                                 | 38"                                                         | 300                                                                                    | 1,000                                                |                                                                                        | 375.                 |                                                                     |                                                                                                                  | 10                                                                                                   | None                                                                                                    |                                                             | None                  | ┢  |
| D-1000                                                                                                | 8'                                                                     | 4'                                                                                    | 31"                                                         | 500                                                                                    |                                                      |                                                                                        | 1100.                | _                                                                   |                                                                                                                  |                                                                                                      |                                                                                                         |                                                             |                       | ╀  |
|                                                                                                       |                                                                        | <u> </u>                                                                              | 31<br>32                                                    |                                                                                        | 2,000                                                |                                                                                        | 3100.                |                                                                     |                                                                                                                  |                                                                                                      |                                                                                                         |                                                             |                       | ╀  |
| 0-2000                                                                                                | 12'                                                                    | 6'                                                                                    | -1'                                                         | 1450                                                                                   | 3,000                                                |                                                                                        |                      | -                                                                   |                                                                                                                  |                                                                                                      |                                                                                                         |                                                             |                       | ╞  |
| D-4000                                                                                                | 20'                                                                    | 6'                                                                                    | 32                                                          | 2250                                                                                   | 10,000                                               |                                                                                        | 4500.                |                                                                     |                                                                                                                  |                                                                                                      | 1                                                                                                       | <u> </u>                                                    |                       | L  |
| aer<br>COSTS<br>1. Cos                                                                                | series<br>ation (                                                      | s packag<br>(800-360<br>tanks a                                                       | pe plant<br>DOW); a<br>und tank                             | s avail<br>lso ava<br>equipm                                                           | able at u<br>ilable wi<br>ent only.                  | th tertia                                                                              | iry trea             | with<br>itment.                                                     | skills i<br><b>PERATION</b><br>1. No movis                                                                       | subsurface<br>needed (no<br>& MAINTE<br>ng parts f                                                   | or surface<br>electricity<br>NANCE REOM<br>or maintenan                                                 | UIREMENTS                                                   |                       |    |
| 1. R&S<br>aer<br>COSTS<br>1. Cos<br>2. Lov                                                            | series<br>ration (<br>sts for<br>v-flush                               | tanks a<br>toilet                                                                     | e plant<br>90 W); a<br>ind tank<br>system<br>RFORMAN        | s avail<br>lso ava<br>equipm<br>and hoo<br>cce-ourreu                                  | ilable wi<br>ent only.<br>k-ups ava                  | th tertia                                                                              | t extra              | with<br>otment.<br>price.                                           | 1. Either<br>skills i<br>OPERATION<br>1. No movin<br>2. In case<br>3. Occasio                                    | subsurface<br>needed (no<br>& MAINTE<br>ng parts f<br>of overlo<br>nal replac                        | or surface<br>electricity<br>NANCE REOM<br>or maintenan                                                 | , etc.).<br>UIREMENTS<br>ce.<br>onal pumping                |                       |    |
| 1. R&S<br>aer<br>COSTS<br>1. Cos                                                                      | series<br>ration (<br>sts for<br>v-flush<br>(R-9                       | s packag<br>(800-360<br>tanks a<br>toilet<br>NICAL PE                                 | ye plant<br>90 W); a<br>und tank<br>system                  | s avail<br>lso ava<br>equipm<br>and hoo<br>CE-OUTPU<br>CTUAL V/                        | ent only.<br>k-ups ava                               | th tertia                                                                              | t extra              | with<br>itment.                                                     | 1. Either :<br>skills i<br>OPERATION<br>1. No movin<br>2. In case                                                | subsurface<br>needed (no<br><b>&amp; MAINTE</b><br>ng parts f<br>of overlo<br>nal replac             | or surface<br>electricity<br>NANCE REO<br>or maintenan<br>ad, conventi                                  | , etc.).<br>UIREMENTS<br>ce.<br>onal pumping<br>k required. |                       |    |
| 1. R&S<br>aer<br>COSTS<br>1. Cos<br>2. Low<br>MODEL<br>NUMBER                                         | series<br>ration (<br>sts for<br>v-flush                               | s packag<br>(800-360<br>tanks a<br>toilet<br>NICAL PE                                 | e plant<br>10 W); a<br>11 ind tank<br>system<br>10 N, A - A | s avail<br>lso ava<br>equipm<br>and hoo<br>CE-OUTPU<br>CTUAL V/                        | ent only.<br>k-ups ava                               | th tertia<br>ilable at<br>OPERATI<br>RANGE                                             | NG KARNING           | with<br>tment.<br>price.<br>Norse<br>Googs<br>Ko noise,<br>ilight 2 | 1. Either<br>skills i<br>OPERATION<br>1. No movin<br>2. In case<br>3. Occasio                                    | subsurface<br>needed (no<br><b>&amp; MAINTE</b><br>ng parts f<br>of overlo<br>nal replac             | or surface<br>electricity<br>NANCE REOM<br>or maintenan<br>ad, conventi<br>ement of bar<br>ET AND OUTLE | , etc.).<br>UIREMENTS<br>ce.<br>onal pumping<br>k required. |                       |    |
| 1. R&S<br>aer<br>COSTS<br>1. Cos<br>2. Low<br>MODEL<br>NUMBER<br>(MAJOR)                              | series<br>ation (<br>sts for<br>-flush<br>IR-3<br>DOO<br>(N) (         | s packag<br>(800-36)<br>tanks a<br>toilet<br>NNICAL PE<br>S REDUCT                    | e plant<br>10 W); a<br>11 ind tank<br>system<br>10 N, A - A | s avail<br>lso ava<br>equipm<br>and hoo<br>CE-OUTPU<br>CTUAL V/                        | ent only.<br>k-ups ava                               | ilable at<br>OPERATI<br>RANGE:<br>ITEMP, OTI                                           | NG KARNING           | with<br>tment.<br>price.                                            | 1. Either<br>skills<br>DPERATION<br>1. No movie<br>2. In case<br>3. Occasio                                      | subsurface<br>needed (no<br>& MAINTE<br>ng parts f<br>of overlo<br>nal replac                        | or surface<br>electricity<br>NANCE REOM<br>or maintenan<br>ad, conventi<br>ement of bar<br>ET AND OUTLE | , etc.).<br>UIREMENTS<br>ce.<br>onal pumping<br>k required. |                       |    |
| 1. R&S<br>aer<br>COSTS<br>1. Cos<br>2. Low<br>MODEL<br>MUMBER<br>(MAJOR)<br>D-750                     | series<br>ation (<br>its for<br>-flush<br>IR = 9<br>Doo<br>(R) 5<br>50 | s packag<br>(800-360<br>tanks a<br>toilet<br>s REOUCT<br>SB<br>(R)<br>60              | e plant<br>10 W); a<br>11 ind tank<br>system<br>10 N, A - A | s avail<br>lso ava<br>equipm<br>and hoo<br>ccourre<br>cruat vi<br>po DTHE<br>IRI<br>95 | ent only.<br>k-ups ava                               | th tertia<br>ilable at<br>nange<br>iteme.of<br>-20° to l<br>when bur                   | NG KARNING           | with<br>tment.<br>price.<br>Norse<br>ocors<br>No noise,<br>ilight 2 | 1. Either<br>skills i<br>DPERATION :<br>1. No movi:<br>2. In case<br>3. Occasio<br>STANDARDA<br>CODES MET<br>FHA | subsurface<br>needed (no<br>& MAINTE<br>ng parts f<br>of overlo<br>nal replac                        | or surface<br>electricity<br>NANCE REQ<br>or maintenan<br>ad, conventi<br>ement of bar<br>ET AND OUTLE  | , etc.).<br>UIREMENTS<br>ce.<br>onal pumping<br>k required. |                       |    |
| 1. R&S<br>aer<br>COSTS<br>1. Cos<br>2. Lov<br>MODEL<br>NUMBER<br>(MAJOR)<br>D-750<br>D-1000           | series<br>ation<br>sts for<br>-flush<br>IR-9<br>BOO<br>(R)<br>50<br>-  | s packag<br>(800-360<br>tanks a<br>toilet<br>NNICAL PE<br>S REDUCT<br>SR<br>(N)<br>60 | e plant<br>10 W); a<br>11 ind tank<br>system<br>10 N, A - A | s avail<br>lso ava<br>equipm<br>and hoo<br>ccourted<br>cruat v/<br>po TTHE<br>95       | ent only.<br>k-ups ava                               | th tertia<br>ilable at<br>nange<br>iteme.of<br>-20° to l<br>when bur                   | NG KARNING           | with<br>tment.<br>price.                                            | 1. Either<br>skills<br>DPERATION<br>1. No movi<br>2. In case<br>3. Occasto<br>STANDARDA<br>CODES MET<br>FHA      | subsurface<br>needed (no<br>Be MAINTE<br>ng parts f<br>of overloa<br>nal replac<br>i<br>INL<br>3"    | or surface<br>electricity<br>NANCE REQ<br>or maintenan<br>ad, conventi<br>ement of bar<br>ET AND OUTLE  | , etc.).<br>UIREMENTS<br>ce.<br>onal pumping<br>k required. |                       |    |
| 1. R&S<br>aer<br>COSTS<br>1. Cos<br>2. Low<br>MODEL<br>MUMBER<br>(MAJOR)<br>D-750<br>D-1000<br>D-2000 | series<br>ation<br>sts for<br>-flush<br>IR-9<br>BOO<br>(R)<br>50<br>-  | s packag<br>(800-360<br>tanks a<br>toilet<br>NNICAL PE<br>S REDUCT<br>SR<br>(N)<br>60 | e plant<br>10 W); a<br>11 ind tank<br>system<br>10 N, A - A | equipm<br>and hoo                                                                      | ent only.<br>k-ups ava                               | th tertia<br>ilable at<br>OPERATI<br>RANGE<br>ITEMP. OT<br>-20° to l<br>when burt<br>- | NG Steel             | with<br>tment.<br>price.<br>coorse<br>coorse<br>ilight ?<br>-       | 1. Either<br>skills<br>DPERATION<br>1. No movin<br>2. In case<br>3. Occasio<br>STANDARD<br>CODES MET<br>FHA      | subsurface<br>needed (no<br>B MAINTEE<br>ng parts f<br>of overlo<br>nal replac<br>3"<br>"<br>"<br>6" | or surface<br>electricity<br>NANCE REQ<br>or maintenan<br>ad, conventi<br>ement of bar<br>ET AND OUTLE  | , etc.).<br>UIREMENTS<br>ce.<br>onal pumping<br>k required. |                       |    |

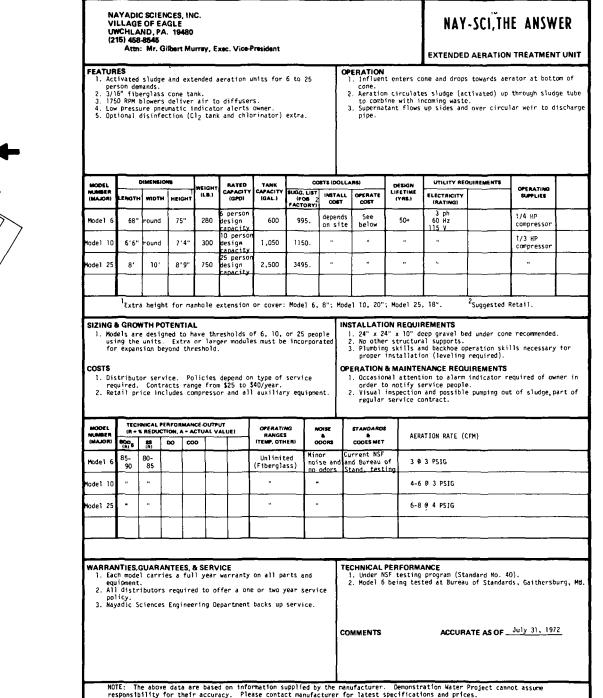


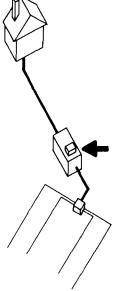


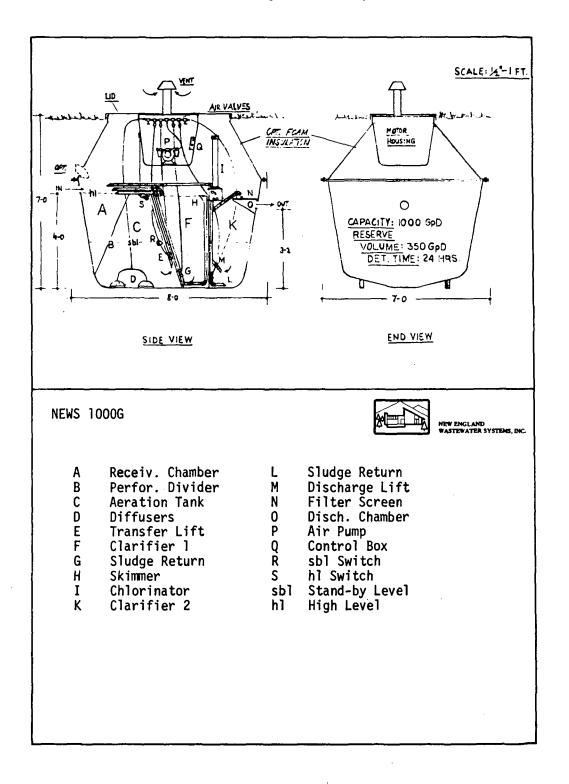
|                                                                                                |                                                                                                                 | Mr. J.                                                                                      | Hobert                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Krebs, E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Xec. Vice                                    | -President                                                                                          |                                                    |                                                                                 |                                                                                                                                                                                                                                 |                                                                                                                                                                        | AERATED FL                                                                                                                                                                                        | OW-THRO                                                  | DUGH FIL                        |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------------|
| gl<br>2. Di<br>3. "L<br>tr                                                                     | bmerged<br>ass tan<br>ffused<br>iving F<br>eatment                                                              | ks.<br>Meratio<br>ilter"<br>(simil                                                          | n provid<br>bags act<br>ar to tr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | des 2000<br>tas sol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ft <sup>3</sup> air<br>ids remo<br>filter)   | t filtrat<br>per poun<br>val and b                                                                  | d BOD <sub>c</sub> .                               |                                                                                 | <ol> <li>Submerg<br/>ment.</li> <li>Draft t</li> <li>Liquid</li> </ol>                                                                                                                                                          | wastes flo<br>ed aerator<br>ube create<br>leaves sys                                                                                                                   | w into aeration<br>bubbles air int<br>s circulation foi<br>tem through a coi<br>er weir to disch:                                                                                                 | o liquid<br>r activat<br>ntrolled                        | ed waste<br>porosity            |
|                                                                                                | -                                                                                                               |                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              | <b></b>                                                                                             | r —                                                |                                                                                 |                                                                                                                                                                                                                                 |                                                                                                                                                                        | ···                                                                                                                                                                                               |                                                          |                                 |
| MODEL<br>NUMBER<br>(MAJOR)                                                                     | LENGTH                                                                                                          | WIDTH                                                                                       | HEIGHT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WEIGHT<br>{LB.}                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RATED<br>CAPACITY<br>(GPD)                   | TANK<br>CAPACITY<br>(GAL)                                                                           | SUGG. LIST                                         | INSTAL                                                                          | OPERATE                                                                                                                                                                                                                         | DESIGN<br>LIFETIME<br>(YRL)                                                                                                                                            | UTILITY REQUIN                                                                                                                                                                                    | EMENTS                                                   | OPERAT<br>SUPPLH                |
| FT3                                                                                            | 54"                                                                                                             | 39"                                                                                         | 77"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 350                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 300                                          | 300                                                                                                 | FACTORY)                                           | 100-30                                                                          |                                                                                                                                                                                                                                 | 3-5                                                                                                                                                                    | (RATINO)<br>115 V AC                                                                                                                                                                              |                                                          | None                            |
| FT5                                                                                            | 72"                                                                                                             | 61"                                                                                         | 77"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 500                                          | 500                                                                                                 | 1200.                                              | Varies                                                                          | year<br>"                                                                                                                                                                                                                       |                                                                                                                                                                        | 1/4 Kw                                                                                                                                                                                            |                                                          |                                 |
| FT+1.0                                                                                         | 90"                                                                                                             | 79"                                                                                         | 88"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1000                                         | 1000                                                                                                | 2000.                                              | <u> </u>                                                                        |                                                                                                                                                                                                                                 |                                                                                                                                                                        | 115 V AC                                                                                                                                                                                          |                                                          |                                 |
|                                                                                                |                                                                                                                 |                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              |                                                                                                     |                                                    | <u> </u>                                                                        | -                                                                                                                                                                                                                               |                                                                                                                                                                        | 1/2 Kw                                                                                                                                                                                            |                                                          |                                 |
| FT-1.5                                                                                         | 96"                                                                                                             | 85"                                                                                         | 94"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1500                                         | 1500                                                                                                | 2500.                                              |                                                                                 | <u> </u>                                                                                                                                                                                                                        |                                                                                                                                                                        | en are electrica                                                                                                                                                                                  |                                                          | -                               |
| 75<br>2. Aei<br>COSTS<br>1. Cui<br>eli                                                         | cing to<br>GPCD.<br>ration of<br>stomer of<br>ectrical                                                          | be basi<br>lesigned<br>in insta<br>work.                                                    | ed on lo<br>J with 2<br>Aller fu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ocal cod<br>2000 ft <sup>3</sup><br>urnishes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | per lb.                                      | o<br>nnecting (                                                                                     | oiping and                                         | for 0                                                                           | ISTALLATI<br>1. Open ex<br>at prop<br>Backfiil<br>2. Plumber<br>3. 4" inle<br>PERATION<br>1. First y<br>alarm s                                                                                                                 | cavation w<br>er elevati<br>l uniforml<br>/electrici<br>t and disc<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.                                                       | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills requir<br>harge connection<br>NANCE REQUIRE<br>quarterly inspect                                                               | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel b<br>stallati<br>e - air |
| 1. Si:<br>75<br>2. Ae<br>COSTS<br>1. Cu:<br>eli                                                | cing to<br>GPCD.<br>ration of<br>stomer of<br>ectrical                                                          | be basi<br>lesigned<br>in insta<br>work.                                                    | ed on lo<br>J with 2<br>Aller fu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ocal cod<br>2000 ft <sup>3</sup><br>urnishes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | per lb.                                      | 800 <sub>5</sub> .                                                                                  | oiping and                                         | for 0                                                                           | ISTALLATI<br>1. Open ex<br>at prop<br>Backfil<br>2. Plumber<br>3. 4" inle<br>PERATION<br>1. First y<br>alarm s<br>2. Call fo<br>3. Occasio                                                                                      | ON REQUI<br>cavation w<br>er elevati<br>1 uniformi<br>/electrici<br>t and disc<br><b>8 MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin                   | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills require<br>harge connections<br>NANCE REQUIRE                                                                                  | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel t<br>stallat<br>e - air  |
| 1. Si:<br>75<br>2. Ae<br>2. Ae<br>1. Cur<br>eli<br>2. Ch                                       | ting to<br>GPCD.<br>ration of<br>stomer of<br>cotrical<br>lorinat:                                              | be basi<br>lesigned<br>or inst.<br>work.<br>on or p                                         | ed on lo<br>d with 2<br>aller fu<br>basteuri<br>RFORMAN<br>ION, A - A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | col cod<br>2000 ft <sup>3</sup><br>urnishes<br>ization<br>wccourpe<br>cctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | per lb.<br><i>intercol</i><br>equipment<br>л | BOD <sub>5</sub> .<br>nnecting p<br>t availabl<br>OPERATI<br>RANGE                                  | piping and<br>le.<br>NG                            | For<br>O                                                                        | NSTALLATI<br>1. Open ex<br>at prop<br>Backfil<br>2. Plumber<br>3. 4" inie<br>PERATION<br>1. First y<br>alarm s<br>2. Call fo<br>3. Occasio<br>4. Dischar<br>STANDARDOR                                                          | ON REQUI<br>cavation w<br>er elevati<br>l uniforml<br>/electrici<br>t and disc<br>& MAINT<br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange             | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills requiri<br>harge connections<br>NANCE REQUIRE<br>quarterly inspeci<br>rvice if necessan<br>g out required.                     | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel t<br>stallat<br>e - air  |
| 1. Si:<br>75<br>2. Aei<br>COSTS<br>1. Cur<br>eli<br>2. Chi<br>MODEL<br>NUMBER<br>(MAJORI       | ting to<br>GPCD.<br>action of<br>stomer of<br>certrical<br>orinat:<br>TECH<br>(R-S<br>(R)S                      | be basi<br>lesigned<br>or inst.<br>work.<br>on or j<br>NICAL PE<br>REDUCT                   | ed on lo<br>d with 2<br>aller fu<br>Dasteuri                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | col cod<br>2000 ft <sup>3</sup><br>urnishes<br>ization<br>wccourpe<br>cctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | per lb.<br><i>intercol</i><br>equipment<br>л | BOD <sub>5</sub> .<br>nnecting (<br>t availabl<br>OPERAT(<br>RANGE<br>(TEMP, OT)<br>Temperate       | biping and<br>e.<br>Ng N<br>IER) g                 | or<br>O<br>Noise                                                                | NSTALLATI<br>1. Open ex<br>a t prop<br>Backfil<br>2. Plumber<br>PERATION<br>1. First y<br>alarm s<br>2. Call fo<br>3. Occasio<br>4. Dischar<br>STANDARDOR<br>STANDARDOR<br>MAS-NRC                                              | ON REQUI<br>cavation w<br>er elevati<br>l uniformi<br>/electrici<br>t and disc<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills requiri<br>harge connections<br>NANCE REQUIRE<br>quarterly inspeci<br>rvice if necessan<br>g out required.                     | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel b<br>stallati<br>e - air |
| 1. Si:<br>75<br>2. Ae<br>COSTS<br>1. Cu:<br>e1<br>2. Ch<br>MODEL<br>NUMBER<br>(MAJOR)<br>FT3   | ting to<br>GPCD.<br>ration of<br>stomer of<br>contrication<br>(R = 3<br>85<br>85                                | vr insta<br>work.<br>on or p<br>RECUCT                                                      | ed on lo<br>d with 2<br>miller fu<br>basteuri<br>RFORMAN<br>ION, A - A<br>DO<br>CC<br>I-6<br>ppm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | col cod<br>2000 ft <sup>3</sup><br>urnishes<br>ization<br>wccourpe<br>cctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | per lb.<br><i>intercol</i><br>equipment<br>л | BOD <sub>5</sub> .<br>nnecting (<br>t availabl<br>corenatic<br>(TENP, OT<br>Temperatic<br>Domestic. | NG N           | ior<br>ior<br>ioise<br>ise. <sup>2</sup><br>odors                               | STALLATI<br>1. Open ex<br>at prop<br>Backfil<br>2. Plumber<br>3. 4" inle<br>PERATION<br>1. First y<br>alarm 5<br>3. Occasio<br>4. Dischar<br>STANDARDM<br>STANDARDM<br>MAS-NRC<br>Publn. 58                                     | ON REQUI<br>cavation w<br>er elevati<br>l uniformi<br>/electrici<br>t and disc<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills requiri<br>harge connections<br>NANCE REQUIRE<br>quarterly inspeci<br>rvice if necessan<br>g out required.                     | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel b<br>stallati<br>e - air |
| 1. Si,<br>75<br>2. Aei<br>COSTS<br>1. Cur<br>ell<br>2. Ch<br>NUMBER<br>MODEL<br>NUMBER<br>FT3  | ting to<br>GPCD.<br>ration of<br>stomer (<br>cctrical<br>orinat:<br>(R-3<br>85<br>(R)<br>85<br>                 | be basi<br>lesigned<br>r inst.<br>work.<br>on or  <br>NICAL PE<br>REDUCT<br>SS<br>(A)<br>85 | ed on lo<br>d with 2<br>hiller fu<br>basteuri<br>BFCORMAN<br>ION, A - A<br>DO CC<br>IAJ CC<br>IAJ CC<br>IAJ CC<br>IAJ CC<br>IAJ CC<br>IAJ CC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | col cod<br>2000 ft <sup>3</sup><br>urnishes<br>ization<br>wccourpe<br>cctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | per lb.<br><i>intercol</i><br>equipment<br>л | BOD5.<br>nnecting (<br>t availabl<br>operati<br>RANGE<br>(TEMP.OT<br>Temperat<br>Domestic.          | ng n<br>HER) c<br>No<br>No<br>No<br>No             | Nor<br>Nor<br>Se. <sup>2</sup><br>adors                                         | STALLATI<br>1. Open ex<br>at propo<br>Backfil<br>2. Plumber<br>3. 4" inie<br>PERATION<br>1. First y<br>alarm s<br>2. Call for<br>3. Occasio<br>4. Dischar<br>TANDARDE<br>TANDARDE<br>MAS-NRC<br>Publn. 58                       | ON REQUI<br>cavation w<br>er elevati<br>l uniformi<br>/electrici<br>t and disc<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills requiri<br>harge connections<br>NANCE REQUIRE<br>quarterly inspeci<br>rvice if necessan<br>g out required.                     | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel t<br>stallati<br>e - air |
| 1. Si,<br>75<br>2. Aei<br>COSTS<br>1. Gui<br>2. Ch<br>MODEL<br>NUMBER<br>(MAJOR)<br>FT3<br>FT5 | ting to<br>GPCD.<br>ration of<br>stomer of<br>corrical<br>orinat:<br>TECH<br>(R-3<br>00)<br>(R)<br>85<br>85<br> | be basi<br>lesigned<br>ir insta<br>work.<br>on or j<br>NICAL PE<br>REDUCT                   | ed on lo<br>d with 2<br>miler fu<br>basteuri<br>mronware<br>lon, a - a<br>Dial Co<br>lo 6<br>ppm<br>-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | col cod<br>2000 ft <sup>3</sup><br>urnishes<br>ization<br>wccourpe<br>cctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | per lb.<br><i>intercol</i><br>equipment<br>л | BOD5.<br>nnecting ;<br>t availabl<br>OPERATI<br>RANGET<br>(TEMP.OT<br>Temperate<br>Domestic.<br>"   | NG NG<br>IE.<br>IERI C<br>IERI C<br>I.<br>No<br>No | For<br>For<br>For<br>For<br>For<br>For<br>For<br>For                            | STALLATI<br>1. Open ex<br>at prop<br>Backfil<br>2. Plumber<br>3. 4" inle<br>PERATION<br>1. First y<br>2. Call for<br>3. Occasio<br>4. Occasio<br>4. Occasio<br>4. Occasio<br>TANDARDA<br>CODES MET<br>NAS-NRC<br>Publn. 58<br>" | ON REQUI<br>cavation w<br>er elevati<br>l uniformi<br>/electrici<br>t and disc<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills requiri<br>harge connections<br>NANCE REQUIRE<br>quarterly inspeci<br>rvice if necessan<br>g out required.                     | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel t<br>stallati<br>e - air |
| 1. Si,<br>75<br>2. Aei<br>COSTS<br>1. Cur<br>ell<br>2. Ch<br>NUMBER<br>MODEL<br>NUMBER<br>FT3  | ting to<br>GPCD.<br>ration of<br>stomer (<br>cctrical<br>orinat:<br>(R-3<br>85<br>(R)<br>85<br>                 | be basi<br>lesigned<br>r inst.<br>work.<br>on or  <br>NICAL PE<br>REDUCT<br>SS<br>(A)<br>85 | ed on lo<br>d with 2<br>hiller fu<br>basteuri<br>RFCRMAA<br>ION, A - A<br>DO, CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>CC<br>IAJ<br>CC<br>IAJ<br>CC<br>CC<br>IAJ<br>CC<br>CC<br>IAJ<br>CC<br>CC<br>IAJ<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC<br>CC | col cod<br>2000 ft <sup>3</sup><br>urnishes<br>ization<br>wccourpe<br>cctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | per lb.<br><i>intercol</i><br>equipment<br>л | BOD5.<br>nnecting (<br>t availabl<br>operati<br>RANGE<br>(TEMP.OT<br>Temperat<br>Domestic.          | NG R<br>EERI C<br>NG NO<br>NO<br>NO                | or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>o | STALLATI<br>1. Open ex<br>at propo<br>Backfil<br>2. Plumber<br>3. 4' inje<br>PERATION<br>1. First y<br>alarm s<br>2. Call for<br>3. Occasio<br>4. Dischar<br>ITANDARDA<br>CODESMET<br>NAS-NRC<br>Publn. 58<br>"                 | ON REQUI<br>cavation w<br>er elevati<br>l uniformi<br>/electrici<br>t and disc<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange | REMENTS<br>ith 6" clearance<br>on with fine sam<br>y.<br>an skills requiri<br>harge connections<br>NANCE REQUIRE<br>quarterly inspeci<br>rvice if necessan<br>g out required.                     | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel t<br>stallat<br>e - air  |
| 1. Si,<br>75<br>2. Aei<br>COSTS<br>1. Gui<br>2. Ch<br>MODEL<br>NUMBER<br>(MAJOR)<br>FT3<br>FT5 | ting to GPCD.<br>GPCD.<br>stomer c<br>tectrical<br>orinat:<br><b>TECH</b><br>(A - 3<br><b>BOO</b><br>85         | be basi<br>lesignew<br>mical PER<br>REDUCT<br>85<br>(n)<br>85<br>4<br>                      | ed on lo<br>d with 2<br>miller fu<br>basteuri<br>mronman<br>ppm<br>n<br>-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Action of the second se | per 1b.                                      | BOD5.<br>nnecting ;<br>t availabl<br>OPERATI<br>RANGET<br>(TEMP.OT<br>Temperate<br>Domestic.<br>"   | NG R<br>EERI C<br>NG NO<br>NO<br>NO                | or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>or<br>o | STALLATI<br>1. Open ex<br>at propo<br>Backfil<br>2. Plumber<br>3. 4' inje<br>PERATION<br>1. First y<br>alarm s<br>2. Call for<br>3. Occasio<br>4. Dischar<br>ITANDARDA<br>CODESMET<br>NAS-NRC<br>Publn. 58<br>"                 | ON REQUI<br>cavation w<br>er elevati<br>l uniformi<br>/electrici<br>a mAINTe<br>ear: free<br>ystem.<br>I local se<br>arrange<br>e arrange                              | REMENTS<br>ith 6" clearance<br>on with fine Sam<br>y.<br>an skills requirn<br>harge connection:<br>NANCE REQUIRE<br>quarterly inspect<br>rvice if necessar<br>g out required.<br>ments necessary. | d or pea<br>ed for in<br>s; 3" pip<br>EMENTS<br>tions to | gravel t<br>stallati<br>e - air |

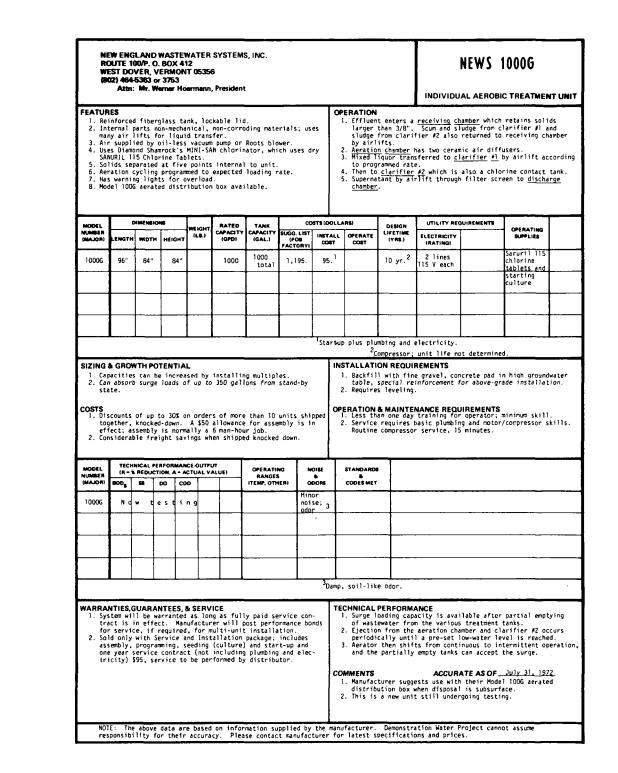


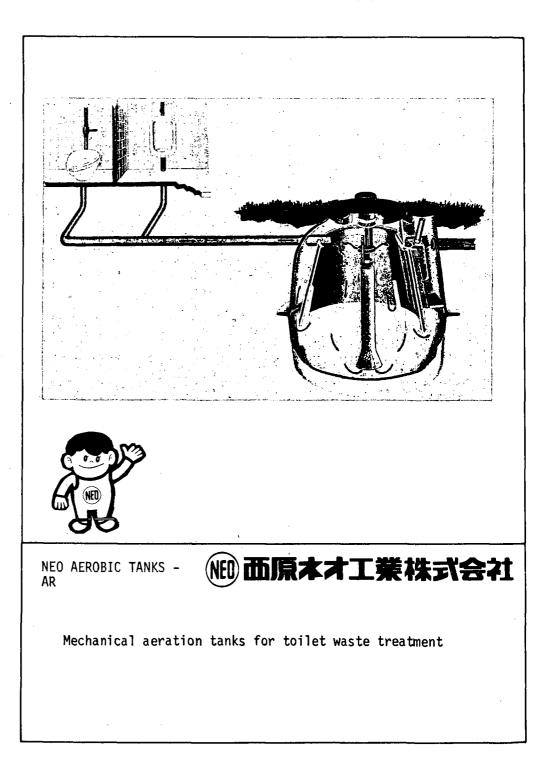






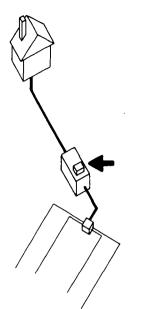




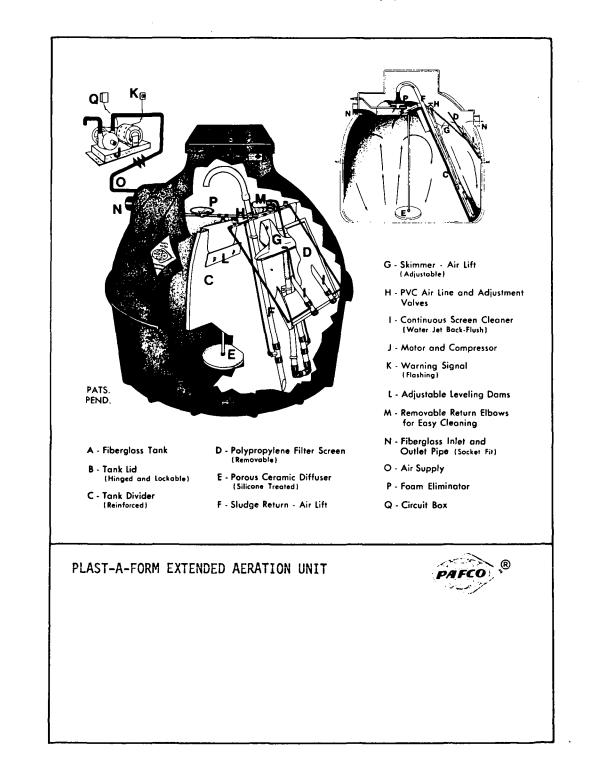


## Appendix C: Survey of Available Equipment

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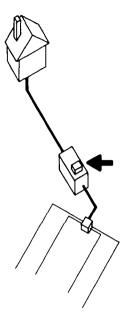


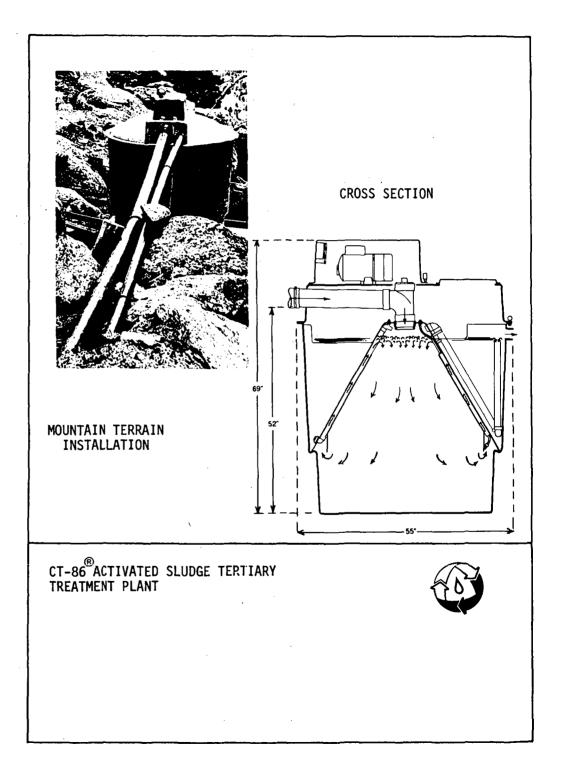
|                                                                                                           | A101:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Dr. As                                                                                                                                            |                                                                                                     |                                                                                                     |                                                                             |                                                                                                           |                                                                                                        |                                           |                                                                                                                                                                                                   |                                                                                                                     | AERO                                                                                                                        | DBIC TREAT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | MENT PLAN                                                       | т                           |
|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------|
| tar<br>2. Des<br>was<br>3. Mec<br>rec<br>spe                                                              | obic ex<br>iks.<br>igned f<br>tewater<br>thanical<br>cycling<br>ecified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | for tre<br>rs not<br>l aerat<br>and ae<br>by man                                                                                                  | atment o<br>used (th<br>ion pull<br>ration (<br>ufacture                                            | of flush<br>Derefore<br>5 sewag<br>believe<br>2r.                                                   | i toilet w<br>lower ra                                                      | aters <u>oni</u><br>ted capac<br>ral slud <u>c</u><br>rechanica                                           | ity).<br>me tube fo<br>1. not                                                                          | ment                                      | ment ta<br>2. Sewage<br>3. Mixed 1<br>settle<br>4. Superna<br>detenti                                                                                                                             | nk.<br>is acrated<br>iquor flow<br>and return<br>tant flows<br>on chamber                                           |                                                                                                                             | ed in inner<br>dimentation<br>tank.<br>" inlet-wei                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | aeration cha<br>ring where s<br>r to disinfed                   | amber.<br>solids<br>stant-  |
| per                                                                                                       | sons.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                   |                                                                                                     |                                                                                                     | ) constru                                                                   |                                                                                                           | 20 100                                                                                                 |                                           | then to                                                                                                                                                                                           | detention                                                                                                           | past pellet-t<br>chamber and                                                                                                | discharge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Infectant Con                                                   | ILdCL ,                     |
| MODEL                                                                                                     | c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | HMENSIO                                                                                                                                           | NE                                                                                                  | WEIGHT                                                                                              | RATED                                                                       | TANK                                                                                                      | ~                                                                                                      | STS (DOL                                  | LARSI                                                                                                                                                                                             | DESIGN                                                                                                              | UTILITY REC                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                 | 1                           |
| NUMBER                                                                                                    | LENGTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WIDTH                                                                                                                                             | HEIGHT                                                                                              | (LB.)                                                                                               | CAPACITY<br>(GPD)                                                           | GAL.                                                                                                      | SUGQ. LIST<br>(FOB<br>FACTORY)                                                                         | COST                                      | L OPERATE                                                                                                                                                                                         | LIFETIME<br>(YRS.)                                                                                                  | ELECTRICITY<br>(RATING)                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | OPERATING<br>SUPPLIES                                           |                             |
| AR-7 <sup>1</sup> /2                                                                                      | 50"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | round                                                                                                                                             | 49"                                                                                                 |                                                                                                     | 5<br>persons                                                                | 211                                                                                                       | 367.                                                                                                   | 100.                                      | 45/yr.                                                                                                                                                                                            | 15+ 4                                                                                                               | 100 V AC<br>50/60 Hz<br>1.1/1.2.amp                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Disinfec-<br>tant<br>tablets                                    |                             |
| AR-10                                                                                                     | 54"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | round                                                                                                                                             | 49"                                                                                                 |                                                                                                     | 10<br>persons                                                               | 275                                                                                                       | 430.                                                                                                   | 103.                                      | 45/yr.                                                                                                                                                                                            |                                                                                                                     |                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                 |                             |
| AR-20                                                                                                     | 66"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | round                                                                                                                                             | 64"                                                                                                 |                                                                                                     | 30<br>persons                                                               | 551                                                                                                       | 1043.                                                                                                  | 140.                                      | 84/yr.                                                                                                                                                                                            |                                                                                                                     | 100 V AC<br>50/60 Hz<br>1.5/1.7 Amp                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                 |                             |
| AR-65                                                                                                     | 97"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | round                                                                                                                                             | 96"                                                                                                 |                                                                                                     | 100<br>persons                                                              | 1833                                                                                                      | 2103.                                                                                                  | 330.                                      | 154/yr.                                                                                                                                                                                           |                                                                                                                     | 100 V AC<br>50/60 Hz<br>2.8/3.2 ampl                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | "                                                               |                             |
| 1. Hyd<br>0.0<br>2. Mod                                                                                   | iraulic<br>1287 lb.<br>lel numb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | and wa<br>BOD5/<br>bers co                                                                                                                        | ste load<br>capita/d                                                                                | sizing<br>ay.<br>to te                                                                              | based on times                                                              |                                                                                                           |                                                                                                        | H                                         | 2. Concret                                                                                                                                                                                        | ON REQUI<br>ion and el<br>e pads rec<br>cement wor                                                                  | REMENTS<br>ectrical skil<br>ommended; abu<br>k necessary f                                                                  | ive ground c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | over/accesswa                                                   | iy.<br>'oadside             |
| 1. Hyd<br>0.0<br>2. Mod<br>(Mo<br>COSTS<br>1. All<br>2. Pip<br>3. Hai<br>4. Ele<br>\$15<br>mot            | prices<br>ing and<br>ntenanc<br>or @ \$4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | and wa<br>BOD5/<br>pers co<br>has lui<br>s are bu<br>i special<br>c cost<br>harges<br>Model i<br>L.72/mo<br>NMCAL PE<br>s REDUCT                  | ste load<br>capita/d<br>rrespond<br>0 M3 vol<br>ased on<br>al earth<br>based o<br>are: M<br>20 - 50 | sizing<br>ay.<br>to te<br>ume).<br>\$1 = 30<br>works a<br>n sludg<br>kodel 7<br>W motor<br>CTUAL V/ | en times<br>O yen.<br>re extra<br>e disposa<br>1/2 and 1<br>@ \$2.54/<br>JT | tank vol<br>costs.<br>1 (pumpir<br>0 - 25 W                                                               | iD and<br>ume in M <sup>3</sup><br>ig).<br>motor (P<br>1 65 - 10<br>iem) o<br>iem, o<br>von Min<br>not | 0 W<br>Ovise<br>A<br>Dors<br>Or<br>Se and | NSTALLATION<br>1. Excavat<br>2. Concret<br>3. Reinfor<br>install<br>PERATION<br>1. Calcium<br>2. 2 month<br>volume                                                                                | ON REQUI<br>Ion and el<br>e pads rec<br>cement wor<br>ation.<br>A MAINTE<br>hypochlor<br>care need<br>ments.<br>try | REMENTS<br>ectrical skil<br>ommended; abu                                                                                   | in deep exc<br>in de in dis in<br>in dis in<br>in dis in dis in | over/accesswa<br>avations or r<br>nfectant chan<br>nfectant and | roadsidi<br>nber.<br>sludge |
| 0.0<br>2. Mod<br>(Mo<br>COSTS<br>1. All<br>2. Pip<br>3. Mai<br>4. Ele<br>\$15<br>mot<br>NAMBER<br>(MANOR) | Iraulic<br>1287 Ib.<br>1287 Ib.<br>1287 Ib.<br>1287 Ib.<br>1097 Ib.<br>1007 Ib | and wa<br>BODs/<br>bers co<br>has l.<br>are bi<br>is are bi<br>is pecial<br>control of the<br>harges<br>Model :<br>.72/mo<br>NHCAL PE<br>S REDUCT | ste load<br>capita/d<br>rrespond<br>D M3 vol<br>ased on<br>al earth<br>based o<br>are: M<br>20 - S0 | sizing<br>ay.<br>to te<br>ume).<br>\$1 = 30<br>works a<br>n sludg<br>kodel 7<br>W motor<br>CTUAL V/ | en times<br>O yen.<br>re extra<br>e disposa<br>1/2 and 1<br>@ \$2.54/<br>JT | tank vol<br>costs.<br>1 (pumpir<br>0 - 25 W<br>mo.; Mode<br>OPERATII<br>RANGE:<br>(TEMP. OT)<br>Temperate | iD and<br>ume in M <sup>3</sup><br>ig).<br>motor (P<br>1 65 - 10<br>iem) o<br>iem, o<br>von Min<br>not | 0 W<br>Ovise<br>A<br>Dors<br>Or<br>Se and | NSTALLATI<br>1. Excavat<br>2. Concret<br>3. Reinfor<br>install<br>PERATION<br>1. Calcium<br>2. 2 month<br>volume<br>3. Special<br>environu<br>STANDAROS<br>CODESMET<br>Japan Minis<br>of Int. Tra | ON REQUI<br>Ion and el<br>e pads rec<br>cement wor<br>ation.<br>A MAINTE<br>hypochlor<br>care need<br>ments.<br>try | REMENTS<br>ectrical skil<br>ommended; abu<br>k necessary f<br>NANCE REQU<br>ite tablets u<br>commended: ae<br>1 pumping out | in deep exc<br>in de in dis in<br>in dis in<br>in dis in dis in | over/accesswa<br>avations or r<br>nfectant chan<br>nfectant and | roadsidi<br>nber.<br>sludge |



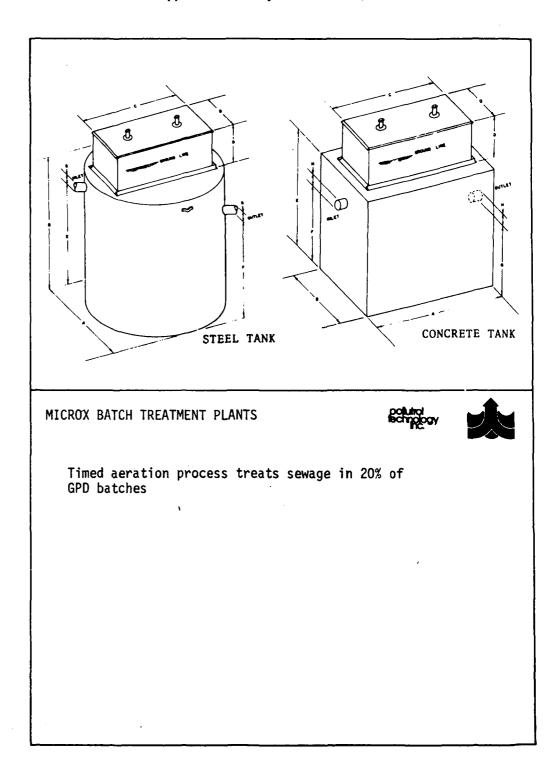
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|                                                                    | 17) 326                                                                                        | 5368                                                                             | ", PA. 177<br>arl W. Te                                                                        |                                                                            |                                                             |                                               |                                                                              |                                                                                                                                    |                                                                                                               | ]                                                                           | PLAST-                                                       | ED AERATIO                                                                           | NU        |
|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------|
| tw<br>2. Po<br>3. Ro<br>b]<br>4. Ai<br>fo<br>5. Po<br>je           | inforce<br>o sizes<br>rous ce<br>tary, o<br>Dwer wi<br>r lift<br>am redu<br>lypropy<br>t back- | - 600<br>ramic c<br>il-less<br>th fill<br>sludge<br>cer pla<br>lene f<br>flush c | and 900<br>diffuser<br>s, carbor<br>ter (5.9<br>and skin<br>ate for 1<br>ilter sci<br>cleaner. | GPD.<br>(silico<br>n vane o<br>CFM 0 2<br>mmer ret<br>foam red<br>reen (re | ne treate<br>r lubrica<br>.5 PSIG).<br>urns defl<br>uction. | ed}.<br>ated steel<br>lect, retu<br>has conti | th filtration<br>I vane type<br>urn sewage of<br>inuous water                | settle<br>2. Supern<br>return<br>3. Liquid<br>f washed<br>4. Sludge                                                                | enters fib<br>out, sewag<br>atant flows<br>removes se<br>flows thro<br>clean and<br>return air<br>ting on cir | e is aerated<br>over tank d<br>ttled solids<br>ugh filter s<br>solids recyc | l.<br>livider to cl<br>creen to dis<br>led.<br>ls back to ma | ration chamber<br>larifier, sluc<br>scharge, scree<br>ain tank after<br>ion and foam | dge<br>en |
|                                                                    | r                                                                                              |                                                                                  |                                                                                                |                                                                            |                                                             | T                                             | <u> </u>                                                                     | <u> </u>                                                                                                                           | <del>,                                     </del>                                                             | Τ                                                                           |                                                              | <b></b>                                                                              | Τ-        |
| MODEL<br>NUMBER                                                    | <u> </u>                                                                                       | J                                                                                | T                                                                                              | WEIGHT                                                                     | RATED                                                       | CAPACITY                                      |                                                                              | IDOLLARS                                                                                                                           | LIFETIME                                                                                                      | ELECTRICITY                                                                 |                                                              | OPERATING                                                                            |           |
| (BAJOR)                                                            | LENGTH                                                                                         | WOTH                                                                             | некант                                                                                         |                                                                            | (GPD)                                                       | (GAL.)                                        |                                                                              | 208T COST )                                                                                                                        | (YRL)                                                                                                         | (RATING)                                                                    | AIR                                                          | SUPPLIES                                                                             | L         |
| AA-604                                                             | 70"                                                                                            | round                                                                            | 66"                                                                                            | 242                                                                        | 600                                                         | 600                                           | 695. Va                                                                      | ries 20/yr.                                                                                                                        |                                                                                                               | 115 V AC<br>(1/4 HP)                                                        | 2380 CFD                                                     | Chlorine,<br>if used                                                                 |           |
| AA- 904                                                            |                                                                                                |                                                                                  | 96"                                                                                            | 327                                                                        | 900                                                         | 900                                           | 945.                                                                         |                                                                                                                                    | Ţ.                                                                                                            | "                                                                           | 3570 CFD                                                     |                                                                                      |           |
|                                                                    |                                                                                                |                                                                                  |                                                                                                |                                                                            |                                                             |                                               |                                                                              |                                                                                                                                    |                                                                                                               |                                                                             | 1                                                            | 1                                                                                    | T         |
|                                                                    |                                                                                                | 1                                                                                | 1                                                                                              |                                                                            |                                                             | 1                                             |                                                                              |                                                                                                                                    | 1                                                                                                             | 1                                                                           |                                                              | 1                                                                                    | t         |
|                                                                    |                                                                                                |                                                                                  |                                                                                                |                                                                            |                                                             |                                               |                                                                              | <sup>1</sup> Electric                                                                                                              | ity only; s                                                                                                   | ervice addit                                                                | ional.                                                       | _                                                                                    |           |
| COSTS                                                              |                                                                                                |                                                                                  |                                                                                                |                                                                            |                                                             |                                               |                                                                              |                                                                                                                                    |                                                                                                               | NANCE REQ                                                                   |                                                              |                                                                                      |           |
| 1. Ba<br>di<br>2. Op                                               | ffuser<br>tions:<br>50 Chlo                                                                    | and sk<br>A400 W<br>rine Co                                                      | immer.<br>Warning A<br>ontact ta                                                               | Alarm, \$<br>ank and                                                       | 33; AB 90<br>dispense                                       | 00 Grease                                     | dge return,<br>Trap, \$324;                                                  | 1. Owner                                                                                                                           | <b>&amp; MAINTE</b><br>must check                                                                             | NANCE REQ<br>alarm light.<br>nce necessar                                   |                                                              |                                                                                      |           |
| 1. Ba<br>di<br>2. Op<br>C2<br>MODEL<br>NUMBER                      | ffuser<br>tions:<br>50 Chlo<br>TECH                                                            | and sk<br>A400 k<br>rine Co<br>NICAL P                                           | immer.<br>Marning A<br>ontact to<br>ERFORMAN<br>TION, A - A                                    | Alarm, \$<br>ank and<br>NCE-OUTPL                                          | 33; AB 90<br>dispenser<br>л                                 | 00 Grease<br>r, \$242.<br>OPERATH<br>RANGES   | Trap, \$324;                                                                 | 1. Owner<br>2. Period                                                                                                              | S & MAINTE<br>must check<br>lic maintena                                                                      | alarm light.                                                                |                                                              |                                                                                      |           |
| 1. Ba<br>di<br>2. Op<br>C2<br>MODEL<br>NUMBER<br>(MAJOR)           | ffuser<br>tions:<br>50 Chlo<br>(R - 1<br>BOO<br>(R) B<br>70-                                   | and sk<br>A400 k<br>rine Co<br>NHCALP                                            | immer.<br>Marning A<br>ontact to<br>ERFORMAN<br>TION, A - A                                    | Alarm, \$<br>ank and                                                       | 33; AB 90<br>dispenser<br>л                                 | 00 Grease<br>r, \$242.                        | Trap, \$324;<br>NG NOISE<br>IER) ODOR<br>Minor                               | 1. Owner<br>2. Period<br>standard<br>s CODES ME<br>Patents                                                                         | S & MAINTE<br>must check<br>lic maintena                                                                      | alarm light.                                                                |                                                              |                                                                                      |           |
| 1. Ba<br>di<br>2. Op<br>C2<br>MODEL<br>NUMBER<br>(MAJOR)<br>AA-604 | ffuser<br>tions:<br>50 Chlo<br>TECH<br>(R = 1<br>(R = 1                                        | and sk<br>A400 k<br>rine Co<br>NICAL P                                           | immer.<br>Marning A<br>ontact to<br>ERFORMAN<br>TION, A - A                                    | Alarm, \$<br>ank and<br>NCE-OUTPL                                          | 33; AB 90<br>dispenser<br>л                                 | 00 Grease<br>r, \$242.<br>OPERATH<br>RANGES   | Trap, \$324;<br>NG NOISE<br>MER) ODOR                                        | 1. Owner<br>2. Period<br>5 STANDARC<br>5 CODES ME<br>Patents<br>Patents                                                            | S & MAINTE<br>must check<br>lic maintena                                                                      | alarm light.                                                                |                                                              |                                                                                      |           |
| 1. Ba<br>di<br>2. Op<br>C2<br>MODEL<br>NUMBER<br>(MAJOR)           | ffuser<br>tions:<br>50 Chlo<br>(R - 1<br>BOO<br>(R) B<br>70-                                   | and sk<br>A400 k<br>rine Co<br>NICAL P                                           | immer.<br>Marning A<br>ontact to<br>ERFORMAN<br>TION, A - A                                    | Alarm, \$<br>ank and<br>NCE-OUTPL                                          | 33; AB 90<br>dispenser<br>л                                 | 00 Grease<br>r, \$242.<br>OPERATH<br>RANGES   | Trap, \$324;<br>NG NOISE<br>KERI ODOR<br>Minor<br>noise                      | 1. Owner<br>2. Period<br>standard<br>s codes me<br>Patents<br>Pending                                                              | S & MAINTE<br>must check<br>lic maintena                                                                      | alarm light.                                                                |                                                              |                                                                                      |           |
| 1. Ba<br>di<br>2. Op<br>C2<br>MODEL<br>NUMBER<br>(MAJOR)<br>AA-604 | ffuser<br>tions:<br>50 Chlo<br>(R - 1<br>BOO<br>(R) B<br>70-                                   | and sk<br>A400 k<br>rine Co<br>NICAL P                                           | immer.<br>Marning A<br>ontact to<br>ERFORMAN<br>TION, A - A                                    | Alarm, \$<br>ank and<br>NCE-OUTPL                                          | 33; AB 90<br>dispenser<br>л                                 | 00 Grease<br>r, \$242.<br>OPERATH<br>RANGES   | Trap, \$324;<br>NG NOISE<br>KERI ODOR<br>Minor<br>noise                      | 1. Owner<br>2. Period<br>standard<br>s codes me<br>Patents<br>Pending                                                              | S & MAINTE<br>must check<br>lic maintena                                                                      | alarm light.                                                                |                                                              |                                                                                      |           |
| 1. Ba<br>di<br>2. Op<br>C2<br>MODEL<br>NUMBER<br>(MAJOR)<br>AA-604 | ffuser<br>tions:<br>50 Chlo<br>(R - 1<br>BOO<br>(R) B<br>70-                                   | and sk<br>A400 k<br>rine Co<br>NICAL P                                           | immer.<br>Marning A<br>ontact to<br>ERFORMAN<br>TION, A - A                                    | Alarm, \$<br>ank and<br>NCE-OUTPL                                          | 33; AB 90<br>dispenser<br>л                                 | 00 Grease<br>r, \$242.<br>OPERATH<br>RANGES   | Trap, \$324;<br>NG Noise<br>Verni Voise<br>Verni Voise<br>Ninor<br>noise<br> | 1. Owner<br>2. Period<br>s CODES ME<br>2<br>2<br>2<br>3<br>3<br>2<br>3<br>3<br>2<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3 | J & MAINTE<br>must check<br>ic maintena<br>25<br>7                                                            | alarm light.<br>nce necessar                                                | y.                                                           |                                                                                      |           |
| 1. Ba<br>di<br>2. Op<br>C2<br>MODEL<br>NUMBER<br>(MAJOR)<br>AA-604 | ffuser<br>tions:<br>50 Chlo<br>(R - 1<br>BOO<br>(R) B<br>70-                                   | and sk<br>A400 k<br>rine Co<br>NICAL P                                           | immer.<br>Marning A<br>ontact to<br>ERFORMAN<br>TION, A - A                                    | Alarm, \$<br>ank and<br>NCE-OUTPL                                          | 33; AB 90<br>dispenser<br>л                                 | 00 Grease<br>r, \$242.<br>OPERATH<br>RANGES   | Trap, \$324;<br>NG Noise<br>Verni Voise<br>Verni Voise<br>Ninor<br>noise<br> | 1. Owner<br>2. Period<br>standard<br>s codes me<br>Patents<br>Pending                                                              | J & MAINTE<br>must check<br>ic maintena<br>25<br>7                                                            | alarm light.<br>nce necessar                                                | y.                                                           |                                                                                      | ble       |

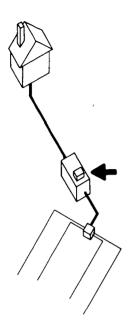


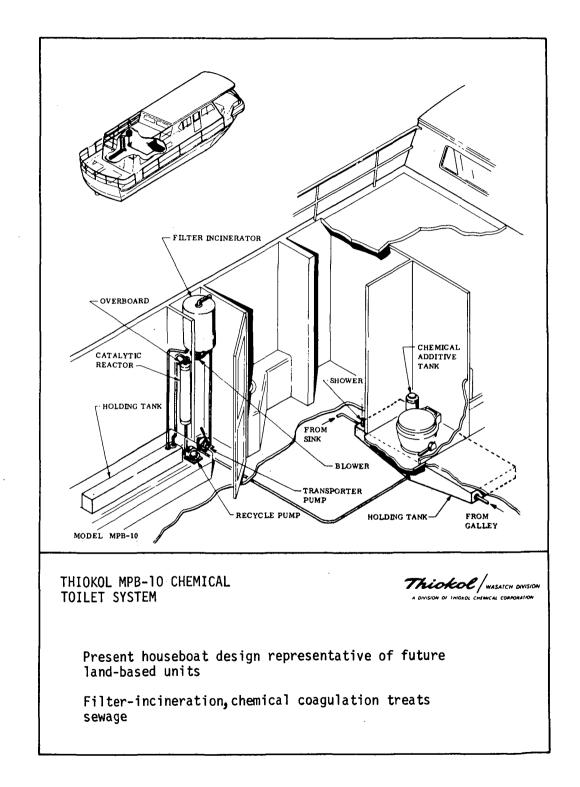


| 10<br>Bi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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Stor                                                                                          | ne, Pres                                                                                                                | lident                                                                                                                                                      |                                                                                   |                                                                                          |                                                                                                 |                                                                                                                                                                        |                                                                                                                                                                            |                                                                                                                                                                                             |                                                                                                                    | IVATED SL                                                                                                    |                                                                |
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Ai<br>to<br>3. Op<br>se<br>4. Su                                                                                                                                    | wage<br>r ring<br>verte<br>ening<br>ttling<br>perna                                                                                                                        | ) diffuses<br>ex/entrance<br>at base of<br>g chamber.<br>tant flows                                                                                                                         | air up sid<br>of cone (<br>cone allo<br>sludge lif<br>over weir                                                    | and aeration<br>es of cone t<br>activated sl<br>ws supernata<br>t and skimme<br>to disinfect<br>weir for dis | o draw was<br>udge).<br>nt to flow<br>r periodic<br>ant-contac |
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                                              | effluent (<br>control d<br>ssor, ove                                              | evices,<br>r 15#/cf                                                                      | etc.,                                                                                           | INSTAL<br>1. Fr<br>bu<br>OPERA<br>1. Re<br>0                                                                                                                           | LATION                                                                                                                                                                     | ON RECUI<br>Inding in t<br>ground lev<br>& MAINTE<br>Carbon van<br>sar, timer                                                                                                               | wasement, r<br>(el) outside<br>NANCE RE(<br>mes and air<br>@ \$2/year.                                             | ecessed in g<br>e.<br><b>DUIREMENT</b><br>filter @ \$4                                                       | 5                                                              |
| 1. Siz<br>det<br>cou<br><b>COSTS</b><br>1. Shi<br>Cla<br>2. 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                   | effluent (<br>control d<br>ssor, ove<br>109 chlor                                 | desired<br>evices,<br>r 15#/cf<br>ine bars                                               | etc.,<br>,                                                                                      | INSTAL<br>1. Fr<br>bu<br>OPERA<br>1. Re<br>0<br>2. S1                                                                                                                  | LATION<br>ee staried (<br>TION<br>place<br>\$10/ye<br>mple o                                                                                                               | CN REQUI<br>Inding in t<br>ground lev<br>& MAINTE<br>carbon var<br>carbon var<br>consciencio                                                                                                | REMENTS<br>basement, rivel) outside<br>NANCE RE(<br>nes and air                                                    | ecessed in g<br>e.<br><b>DUIREMENT</b><br>filter @ \$4                                                       | 5                                                              |
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Fr<br>bu<br>OPERA<br>1. Re<br>@<br>2. S1<br>stal                                                                                                          | LATION                                                                                                                                                                     | CN REQUI<br>Inding in t<br>ground lev<br>& MAINTE<br>carbon van<br>carbon van<br>car, timer<br>consciencio                                                                                  | REMENTS<br>basement, rivel) outside<br>NANCE RE(<br>hes and air<br>@ \$2/year.                                     | ecessed in g<br>e.<br><b>DUIREMENT</b><br>filter @ \$4                                                       | 5                                                              |
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                          | effluent d<br>control d<br>ssor, ove<br>109 chlor<br>RANGE                        | desired<br>evices,<br>r 15#/cf<br>ine bars<br>ieRi<br>ed no                              | etc.,                                                                                           | INSTAL<br>1. Fr<br>bu<br>OPERA<br>1. Re<br>@<br>2. S1<br>stal<br>con<br>U.S.P                                                                                          | LATION<br>ee sta<br>ried (<br>place<br>\$10/ye<br>mple o                                                                                                                   | ON REQUI<br>anding in b<br>ground lev<br>& MAINTE<br>carbon var<br>aar, timer<br>consciencto                                                                                                | REMENTS<br>basement, rivel) outside<br>NANCE RE(<br>hes and air<br>@ \$2/year.                                     | ecessed in g<br>e.<br><b>DUIREMENT</b><br>filter @ \$4                                                       | 5                                                              |
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If<br>NUMBER<br>(MAJORI<br>CT-86                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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                          | effluent d<br>control d<br>ssor, ove<br>109 chlor<br>RANGES<br>ITEMP, OTH         | desired<br>evices,<br>r 15#/cf<br>ine bars<br>ieRi<br>ed no                              | etc.,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>, | INSTAL<br>1. Fr<br>bu<br>OPERA<br>1. Re<br>@<br>2. S1<br>stal<br>con<br>U.S.P                                                                                          | LATION<br>ee star<br>ried (<br>place<br>\$10/ye<br>mple (<br>wDARDS<br>&<br>ES MET<br>atent:                                                                               | ON REQUI<br>anding in b<br>ground lev<br>& MAINTE<br>carbon var<br>aar, timer<br>consciencto                                                                                                | REMENTS<br>basement, rivel) outside<br>NANCE RE(<br>hes and air<br>@ \$2/year.                                     | ecessed in g<br>e.<br><b>DUIREMENT</b><br>filter @ \$4                                                       | 5                                                              |
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If<br>NUMBER<br>(MAJORI<br>CT-86                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | plast<br>\$50.0<br>sed,<br>ERFOR                                                          | pacity<br>acity,<br>ty.<br>ic tan<br>00.<br>\$2/mon<br>MAANCE 4<br>A = ACTU                      | while<br>k with<br>th on T<br>OUTPUT<br>IAL VALL<br>OTHE<br>0.1 m<br>J Stee                                             | water of compre-<br>compre-<br>Tesco H                                                                                                                      | effluent o<br>control d<br>ssor, ove<br>109 chlor<br>OPERATH<br>RANGES<br>Unlimit | desired<br>evices,<br>r 15#/cf<br>ine bars<br>ieR)<br>Mi<br>ed no                        | etc.,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>, | INSTAL<br>1. Fr<br>bu<br>OPERA<br>1. Re<br>@<br>2. S1<br>stal<br>con<br>U.S.P                                                                                          | LATION<br>ee star<br>ried (<br>place<br>\$10/ye<br>mple (<br>wDARDS<br>&<br>ES MET<br>atent:                                                                               | ON REQUI<br>anding in b<br>ground lev<br>& MAINTE<br>carbon var<br>aar, timer<br>consciencto                                                                                                | REMENTS<br>basement, rivel) outside<br>NANCE RE(<br>hes and air<br>@ \$2/year.                                     | ecessed in g<br>e.<br><b>DUIREMENT</b><br>filter @ \$4                                                       | 6                                                              |
| 1. Siz<br>det<br>cou<br>COSTS<br>1. Shi<br>Cla<br>2. If<br>MODEL<br>NUMBER<br>IMAJORI<br>CT-86<br>No. 375                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ed for<br>ermine:<br>Id inc:<br>sping i<br>sping i<br>chlorit<br>rece.<br>(R -                                                                  | extra:<br>, 300#<br>s REDUC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | son ca<br>l cap<br>capaci<br>plast<br>\$50.0<br>sed,<br>ERFOR<br>500.0                    | pacity,<br>ty.<br>ty.<br>ty.<br>\$2/mon<br>\$2/mon<br>\$2/mon<br>\$2/mon<br>\$2/mon              | while<br>k with<br>th on 1<br>DUTPUT<br>IAL VALL<br>OTHE<br>3<br>Set 1                                                  | water of compre-<br>Tesco H<br>UEI<br>ER 3<br>mI/<br>er<br>J<br>U<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L<br>L | effluent d<br>control d<br>ssor, ove<br>109 chlor<br>RANGES<br>ITEMP, OTH         | desired<br>evices,<br>r 15#/cf<br>ine bars<br>ieR)<br>Mi<br>ed no                        | etc.,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>, | INSTAL<br>1. Fr<br>bu<br>OPERA<br>1. Re<br>2. S1<br>U.S.P.<br>No. 3                                                                                                    | LLATII<br>ee sta<br>ried (<br>place<br>\$10/yc<br>mple c<br>*<br>*<br>*<br>*<br>*                                                                                          | ON REQUI<br>Inding in b<br>ground lev<br>& MAINTE<br>carbon val<br>tar, timer<br>consciencio                                                                                                | REMENTS<br>aasement, ri<br>e) outside<br>NANCE REC<br>nes and air<br>es and air<br>e \$2/year.<br>uus labor ri     | ecessed in g<br>e.<br><b>DUIREMENT</b><br>filter @ \$4                                                       | 6                                                              |
| <ul> <li>Siz det<br/>det<br/>cou</li> <li>COSTS</li> <li>Shi Cla</li> <li>Shi Cla</li> <li>If</li> <li>MODEL</li> <li>MODEL<td>ed for<br/>ermine:<br/>1d inci<br/>pping ss #70<br/>chlorin<br/>#00g<br/>WTIES,<br/>year v<br/>year v<br/>year v<br/>year v<br/>year v<br/>year v<br/>year v</td><td>S pers s actuarease c sactuarease c sactuare</td><td>son ca<br/>capaci<br/>plast t<br/>\$50.0<br/>used,<br/>b<br/>rereform<br/>triow, /<br/>b<br/>o</td><td>pacity,<br/>acity,<br/>ic tan<br/>0.<br/>\$2/mon<br/><b>ES, &amp; S</b><br/>parts :<br/>requi<br/>1 cost</td><td>while<br/>k with<br/>th on 1<br/>OUTPUT<br/>AL VALL<br/>0 THE<br/>0 THE<br/>1 I I<br/>3 Set 1<br/>ERVICE<br/>\$100 ;<br/>rements :</td><td>vet<br/>compre<br/>Tesco H<br/>ER 3<br/>m1/<br/>gr<br/>fr<br/>tleable<br/>E 6 day ff<br/>s and co</td><td>effluent o<br/>control d<br/>ssor, ove<br/>109 chlor<br/>OPERATH<br/>RANGES<br/>Unlimit</td><td>desired<br/>evices,<br/>r 15#/cf<br/>ine bars<br/>eed no<br/>3<br/>3<br/>ce.<br/>rts.<br/>operato</td><td>NOISE<br/>COCORS<br/>DOT<br/>Se and<br/>F.D.odo</td><td>INSTAL<br/>INSTAL<br/>1. Fr<br/>bu<br/>OPERA<br/>2. S1<br/>STAL<br/>COD<br/>U.S.P.<br/>No. 3<br/>V.S.P.<br/>No. 3<br/>STAL<br/>COD<br/>COD<br/>COD<br/>COD<br/>COD<br/>COD<br/>COD<br/>COD</td><td>LLATION<br/>ee sta<br/>ried (<br/>TION<br/>place<br/>\$10/yd<br/>mple (<br/>vDARD3<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*<br/>*</td><td>ON REQUI<br/>Inding in b<br/>ground lev<br/>&amp; MAINTE<br/>carbon val<br/>carbon val<br/>carbon val<br/>carbon val<br/>carbon val<br/>to file<br/>PERFORM.<br/>ter dischais<br/>is (less ti<br/>s current)</td><td>REMENTS<br/>assement, r.<br/>(e) outside<br/>NANCE REC<br/>les sand afr<br/>(s \$2/year.<br/>uus labor rr<br/>ge surpass.</td><td>ecessed in g<br/>2-<br/><b>XUIREMENTI</b><br/>filter 0 \$4<br/>equired.</td><td>S<br/>/year, ozc</td></li></ul> | ed for<br>ermine:<br>1d inci<br>pping ss #70<br>chlorin<br>#00g<br>WTIES,<br>year v<br>year v<br>year v<br>year v<br>year v<br>year v<br>year v | S pers s actuarease c sactuarease c sactuare | son ca<br>capaci<br>plast t<br>\$50.0<br>used,<br>b<br>rereform<br>triow, /<br>b<br>o     | pacity,<br>acity,<br>ic tan<br>0.<br>\$2/mon<br><b>ES, &amp; S</b><br>parts :<br>requi<br>1 cost | while<br>k with<br>th on 1<br>OUTPUT<br>AL VALL<br>0 THE<br>0 THE<br>1 I I<br>3 Set 1<br>ERVICE<br>\$100 ;<br>rements : | vet<br>compre<br>Tesco H<br>ER 3<br>m1/<br>gr<br>fr<br>tleable<br>E 6 day ff<br>s and co                                                                    | effluent o<br>control d<br>ssor, ove<br>109 chlor<br>OPERATH<br>RANGES<br>Unlimit | desired<br>evices,<br>r 15#/cf<br>ine bars<br>eed no<br>3<br>3<br>ce.<br>rts.<br>operato | NOISE<br>COCORS<br>DOT<br>Se and<br>F.D.odo                                                     | INSTAL<br>INSTAL<br>1. Fr<br>bu<br>OPERA<br>2. S1<br>STAL<br>COD<br>U.S.P.<br>No. 3<br>V.S.P.<br>No. 3<br>STAL<br>COD<br>COD<br>COD<br>COD<br>COD<br>COD<br>COD<br>COD | LLATION<br>ee sta<br>ried (<br>TION<br>place<br>\$10/yd<br>mple (<br>vDARD3<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>*<br>* | ON REQUI<br>Inding in b<br>ground lev<br>& MAINTE<br>carbon val<br>carbon val<br>carbon val<br>carbon val<br>carbon val<br>to file<br>PERFORM.<br>ter dischais<br>is (less ti<br>s current) | REMENTS<br>assement, r.<br>(e) outside<br>NANCE REC<br>les sand afr<br>(s \$2/year.<br>uus labor rr<br>ge surpass. | ecessed in g<br>2-<br><b>XUIREMENTI</b><br>filter 0 \$4<br>equired.                                          | S<br>/year, ozc                                                |



|                                                                                                                                                                          |                                                                                                                                       | Mr. P                                                                           | aul Fle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ming, Sal                                                                                                                   | es Manager                                                              |                                                                 |                                          | ·                                                       |                                                                                                                          |                                                                                               |                                                                                           | AERATION                                             | IN UNIT                                                         | _   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------|-----|
| in<br>2. Ba<br>3. Ti<br>4. Wa<br>5. Mi                                                                                                                                   | eel and<br>land or<br>tch, ex<br>mer con<br>rning l<br>crox II                                                                        | wateri<br>tended<br>trols l<br>ights :<br>for in                                | way dis<br>aerat<br>batch s<br>signify<br>bland c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | scharge i<br>ion and a<br>process.<br>y malfund<br>discharge                                                                | package t<br>many-size<br>ictivated :<br>tions.<br>Microx<br>e type tai | d models)<br>sludge pro<br>III for wa                           | ocesses (<br>aterway (                   | or<br>used.                                             | aeratio<br>2. Waste t<br>(20% of<br>3. Aeratio                                                                           | hamber is<br>n.<br>ransferred<br>daily flo<br>n followed                                      | by air lift<br>#/batch).                                                                  | to settling<br>takes place                           | ber, waste ur<br>  chamber in t<br>  in settling<br>s returned. | bat |
| _                                                                                                                                                                        | DIMENSIONS ]                                                                                                                          |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                             | 1                                                                       | T                                                               | <u> </u>                                 | COETS (DOL                                              | LARS                                                                                                                     |                                                                                               | UTILITY REQUIREMENTS                                                                      |                                                      | <u>1                                    </u>                    |     |
| MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                               | LENGTH                                                                                                                                | T                                                                               | T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | WEIGH                                                                                                                       | T CAPACITY<br>(GPD)                                                     | CAPACITY                                                        |                                          | INSTAL                                                  | · · · · · · · · · · · · · · · · · · ·                                                                                    | DESIGN<br>LIFETIME<br>(YRS.)                                                                  | ELECTRICITY<br>(RATING)                                                                   |                                                      | OPERATING<br>SUPPLIES                                           |     |
| Microx<br>II                                                                                                                                                             | 54-84                                                                                                                                 | roun                                                                            | 1 84-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 96" 650-<br>1900                                                                                                            | 300-<br>1250                                                            | 300-<br>1250                                                    | 1,155                                    | - Varies                                                | 40-100/<br>year                                                                                                          | 20-40 on<br>steel 4<br>tank                                                                   | 115 V AC                                                                                  |                                                      | Chlorine,<br>if used                                            | T   |
| Microx<br>III                                                                                                                                                            | 65-84                                                                                                                                 | " round                                                                         | 1 87-9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 96" 800-<br>1900                                                                                                            | 500-<br>1000                                                            | 500-<br>1000                                                    | 1,670                                    |                                                         |                                                                                                                          |                                                                                               |                                                                                           |                                                      |                                                                 |     |
|                                                                                                                                                                          |                                                                                                                                       |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                             |                                                                         |                                                                 |                                          |                                                         |                                                                                                                          |                                                                                               |                                                                                           |                                                      |                                                                 |     |
|                                                                                                                                                                          |                                                                                                                                       |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                             |                                                                         |                                                                 |                                          |                                                         |                                                                                                                          |                                                                                               |                                                                                           |                                                      |                                                                 |     |
| 2. Ba                                                                                                                                                                    | & GROM                                                                                                                                | pump co<br>e incli                                                              | osts \$1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 140. extr                                                                                                                   | reatment (                                                              | equipment.                                                      |                                          |                                                         | NSTALLATI<br>1. License<br>2. Operato<br>3. Treatme                                                                      | ON REQUI<br>d plumber<br>r has mino<br>nt tank to                                             | averages 5 s<br>REMENTS<br>and excavator<br>r responsibil<br>be coated with<br>NANCE REQU | r skills nee<br>lities.<br>ith Bitumast              | ic- <b>50</b> .                                                 |     |
| COSTS<br>1. Ef<br>2. Ba<br>3. Op                                                                                                                                         | & GROM                                                                                                                                | pump co<br>e inclu<br>costs                                                     | osts \$1<br>ides ta<br>are fo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 140. extr<br>ank and f<br>or electr                                                                                         | ·a.                                                                     | equipment.                                                      |                                          | 1                                                       | NSTALLATI<br>1. License<br>2. Operato<br>3. Treatme                                                                      | ON REQUI<br>d plumber<br>r has mino<br>nt tank to                                             | REMENTS<br>and excavator<br>r responsibil<br>be coated wi                                 | r skills nee<br>lities.<br>ith Bitumast              | ic- <b>50</b> .                                                 |     |
| COSTS<br>1. Ef<br>2. Ba<br>3. Op<br>4. Ch<br>MODEL<br>NUMBER                                                                                                             | fluent<br>se pric<br>erating<br>lorinat                                                                                               | pump co<br>e inclu<br>costs<br>ion is                                           | DTENT<br>Dides ta<br>are fo<br>extra<br>ERFORM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 140. extr<br>ank and to<br>or electr<br>- Actual                                                                            | a.<br>reatment (<br>icity onl)                                          | equipment.<br>y.<br>OPERATI                                     | NG S                                     |                                                         | NSTALLATI<br>1. License<br>2. Operato<br>3. Treatme<br>PERATION<br>STANDARDX                                             | ON REQUI<br>d plumber of<br>r has mino<br>nt tank to<br>& MAINTE                              | REMENTS<br>and excavator<br>r responsibil<br>be coated wi                                 | r skills nee<br>lities.<br>ith Bitumast              | ic- <b>50</b> .                                                 |     |
| COSTS<br>1. Ef<br>2. Ba<br>3. Op<br>4. Ch                                                                                                                                | fluent<br>se pric<br>lorinat                                                                                                          | pump cd<br>e inclu<br>costs<br>ion is                                           | DTENT<br>Dists \$1<br>Dides ta<br>are fo<br>extra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 140. extr<br>ank and t<br>or electr                                                                                         | a.<br>reatment (<br>icity onl)                                          | equipment.<br>y.<br>OPERATI                                     | NG<br>S<br>StER)<br>N                    | NORSE                                                   | NSTALLATI<br>1. License<br>2. Operato<br>3. Treatme<br>PERATION                                                          | ON REQUI<br>d plumber of<br>r has mino<br>nt tank to<br>& MAINTE                              | REMENTS<br>and excavator<br>r responsibil<br>be coated wi                                 | r skills nee<br>lities.<br>ith Bitumast              | ic- <b>50</b> .                                                 |     |
| COSTS<br>1. Ef<br>2. Ba<br>3. Op<br>4. Ch<br>MODEL<br>MODEL<br>(MAJOR)                                                                                                   | fluent<br>se pric<br>erating<br>lorinat<br>(m =<br>(R)<br>90-                                                                         | Pump co<br>e inclu<br>costs<br>ion is<br>INICAL ?<br>K REDUC                    | DTENT<br>Dides to<br>are fo<br>extra<br>ERFORM<br>TION, A<br>DO<br>TAL<br>2-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 140. extr<br>ank and to<br>or electr<br>- Actual                                                                            | a.<br>reatment (<br>icity onl)                                          | equipment.<br>y:<br>RANGE<br>(TENF, OT)<br>Unlimite             | NG<br>S<br>StER)<br>N                    | NORSE<br>A<br>ODORS<br>INDY<br>DISE and                 | VSTALLATI<br>1. License<br>2. Operato<br>3. Treatme<br>PERATION<br>STANDARCK<br>CODES MET<br>Several<br>states           | ON REQUI<br>d plumber of<br>r has mino<br>nt tank to<br>& MAINTE                              | REMENTS<br>and excavator<br>r responsibil<br>be coated wi                                 | r skills nee<br>lities.<br>ith Bitumast              | ic- <b>50</b> .                                                 |     |
| COSTS<br>1. Ef<br>2. Ba<br>3. Op<br>4. Ch<br>MODEL<br>MODEL<br>(MAJOR)                                                                                                   | fluent<br>se pric<br>erating<br>lorinat<br>(m =<br>(R)<br>90-                                                                         | Pump co<br>e inclu<br>costs<br>ion is<br>INICAL ?<br>K REDUC                    | DTENT<br>Dides to<br>are fo<br>extra<br>ERFORM<br>TION, A<br>DO<br>TAL<br>2-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 140. extr<br>ank and to<br>or electr<br>- Actual                                                                            | a.<br>reatment (<br>icity onl)                                          | equipment.<br>y:<br>RANGE<br>(TENF, OT)<br>Unlimite             | NG<br>S<br>StER)<br>N                    | NOISE<br>A<br>A<br>DOORS<br>INOY<br>Dise and<br>D odors | NSTALLATI<br>1. License<br>2. Operato<br>3. Treatme<br>PERATION<br>STANDARD<br>CODES MIT<br>Several<br>states<br>approve | ON REQUI<br>d plumber<br>r has mino<br>nt tank to<br>& MAINTE                                 | REMENTS<br>and excavator<br>r responsibil<br>be coated with<br>NANCE REQU                 | r skills nee<br>lities.<br>ith Bitumast              | ic- <b>50</b> .                                                 |     |
| COSTS<br>1. Ef<br>2. Ba<br>3. Op<br>4. Ch<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>1. 1<br>2. Se<br>3. 0 e<br>3. 0 e<br>4. Ch | B GROM<br>fluent<br>se price<br>rating<br>orinat<br>TECC<br>(R - '<br>90-<br>95<br>95<br>95<br>NTIES,<br>year wa<br>vice c<br>aler in | Dump cc<br>e incli<br>costs<br>ion is<br>s REDUC<br>90-<br>95<br>GUARA<br>GUARA | DTENT<br>Dides to<br>are for<br>are | IAL<br>140. extr<br>ank and 1<br>or electr<br>- ACTUAL<br>COD<br>S, & SER<br>rts and with the second<br>i lable as offers s | a.<br>reatment of<br>icity on)                                          | equiprent.<br>y.<br>Unlimit<br>in U.S.<br>\$156 /yeen<br>tract. | HG<br>S<br>KER)<br>R<br>N<br>N<br>N<br>N | NOISE<br>A<br>A<br>DOORS<br>INOY<br>Dise and<br>D odors | Several<br>Several<br>Severation<br>Standadd<br>codes Met<br>Several<br>States<br>approve                                | ON REQUI<br>d plumber<br>r has mino<br>nt tank to<br>& MAINTE<br>s<br>PERFORM.<br>ODX collifo | REMENTS<br>and excavator<br>r responsibili<br>be coated with<br>NANCE REQU                | r skills nee<br>litles.<br>ith Bitumast<br>JIREMENTS | ic- <b>50</b> .                                                 |     |





|                                                                                            | P. O. BO<br>BRIGH/<br>(801) 80                                 | AM CITY<br>3-3511<br>m: Paul                            | , UTAH<br>D. Nanc                               | æ, Mana                  | ger<br>Control Sy          | rstems                                          |                                  |              |                                                                                                                  |                                                                  | CATA                                         | LYTIC REA                                                | MPB-10<br>CTOR,<br>ATOR SYSTE                                                 |      |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|--------------------------|----------------------------|-------------------------------------------------|----------------------------------|--------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------|------|
| 2. Fi<br>3. Ovi<br>4. Ovi<br>5. Lei<br>fi                                                  | all hou<br>Iter in<br>erboard<br>mer-ope<br>vel ind<br>Ils, fo | cinerato<br>dischar<br>rated pr<br>icator w<br>r operat | r and c<br>ge.<br>ocessin<br>ith aud<br>or to p | g.<br>ible al<br>rocess. | c reactor<br>arm sound     | -                                               | system.<br>wastes.<br>imary tank | 3            | <ul> <li>Operato</li> <li>(5 minu</li> <li>Operato</li> <li>through</li> <li>(30 min</li> <li>Treated</li> </ul> | r activates<br>tes) to sec<br>r activates<br>catalytic<br>utes). | condary holdi<br>recycle pum<br>reactor whil | e water thro<br>ng tank.<br>p to process<br>e solids aro | m sounds.<br>ough filter b<br>s supernatant<br>e incinerated<br>t process ope |      |
|                                                                                            |                                                                | DIMENSION                                               |                                                 |                          |                            | <b></b>                                         |                                  | 78 (DOLLA    | Pr()                                                                                                             |                                                                  | UTILITY REG                                  |                                                          |                                                                               |      |
| NODEL<br>UMBER<br>(MAJOR)                                                                  | 01A <sup>1</sup>                                               | DIA <sup>2</sup>                                        | неіант                                          | WEIGHT<br>(LB.)          | RATED<br>CAPACITY<br>(OPD) | TANK<br>CAPACITY<br>(QAL.) 3                    |                                  | INSTALL      | OPERATE<br>COST                                                                                                  | DESIGN<br>LIFETIME<br>(YRS.)                                     | ELECTRICITY<br>(RATING) 4                    | OTHER <sup>5</sup>                                       | OPERATING<br>SUMPLIES                                                         | u    |
| \$PB-10<br>(15)                                                                            | 12"<br>12"<br>12"                                              | 5"<br>5"<br>7"                                          | 5 to<br>7'                                      |                          | 15<br>60<br>60             | 15                                              | ca \$500.                        |              | See<br>Costs<br>Below                                                                                            | 20                                                               | 20<br>80<br>80                               | 0.36                                                     | 0.36<br>0.72<br>0.72                                                          |      |
| (98-10<br>(30)                                                                             | 12"<br>17"                                                     | 7"<br>9.1"                                              |                                                 |                          | 120<br>100                 | 30                                              |                                  |              |                                                                                                                  | "                                                                | 160<br>100                                   | 2.88                                                     | 1.44                                                                          |      |
| PB-10<br>(50)                                                                              | 17"                                                            | 9.1"                                                    |                                                 |                          | 250                        | 50                                              |                                  |              | u                                                                                                                | "                                                                | 250                                          | 6.0                                                      | 3.0                                                                           |      |
| ₽B-10<br>(100)                                                                             | 24"                                                            | 13"                                                     | "                                               |                          | 500                        | 100                                             | ca \$1000.<br>fng tank ca        |              |                                                                                                                  | -                                                                | 550                                          | 12.0<br>/day Propan                                      | 6.0                                                                           |      |
| 50-<br>OSTS<br>1. Cos<br>dev<br>2. Mor<br>3. Ope                                           | 2000 Gi<br>its are<br>relopment                                | PD.<br>not det                                          | ermined                                         | for la                   | nd-based                   | e in the<br>models un<br>le from d<br>y, gas, a | der                              | 1            | . Daily of                                                                                                       |                                                                  | NANCE REQU<br>owner (futu                    |                                                          | omated).                                                                      |      |
| '* chi                                                                                     |                                                                |                                                         | FORMAN                                          | CE-OUTPO                 |                            | OPERATIN                                        |                                  |              | STANDARDS                                                                                                        | -                                                                |                                              |                                                          |                                                                               |      |
|                                                                                            | TECH<br>(R - S                                                 | NICAL PER                                               | ON, A - A                                       | CTUAL V                  |                            |                                                 |                                  |              |                                                                                                                  |                                                                  |                                              |                                                          |                                                                               |      |
| MODEL<br>(UNBER<br>(MAJOR)                                                                 | (n - 1<br>900 <sub>6</sub><br>(R) 5                            | SE (                                                    | 011, A - A<br>20 C0<br>18                       | -                        |                            | TEMP, OTH                                       | ER) OCH                          | O <b>FIS</b> | CODESMET                                                                                                         |                                                                  |                                              |                                                          |                                                                               |      |
| MODEL<br>(UNILER<br>(MAJOR)<br>(PB-10<br>(15)                                              | (n - 1<br>1000<br>(R) 5<br>99                                  | SE (                                                    | 0N, A - A<br>X0 C0<br>18<br>81                  | 0<br>0                   |                            | 32° to 1                                        | 50°F noise<br>No oc              | 0 <b>FRS</b> |                                                                                                                  |                                                                  |                                              |                                                          |                                                                               |      |
| MODEL<br>(JANDER<br>(MAJOR)<br>(15)<br>(78-10<br>(30)<br>(78-10                            | (n - 1<br>ROD<br>(R) 5<br>99                                   | SE         I           99                               | ON, A - A<br>DO CO<br>18<br>81                  | 0                        |                            |                                                 | ER) OD<br>50°F noise<br>No oc    | 0 <b>FRS</b> |                                                                                                                  |                                                                  |                                              |                                                          |                                                                               |      |
| MODEL<br>(JAMBER<br>(MAJOR)<br>(15)<br>(15)<br>(15)<br>(15)<br>(15)<br>(15)<br>(15)<br>(15 | (n - 1<br>1000<br>(R) 5<br>99                                  | SE (                                                    | 0N, A - A<br>20 C0<br>18<br>81                  | 0<br>0                   |                            | 32° to 1                                        | 50°F noise<br>No oc              | 0 <b>FRS</b> |                                                                                                                  |                                                                  |                                              |                                                          |                                                                               |      |
| PB-10<br>(15)<br>PB-10<br>(30)<br>PB-10<br>(50)<br>PB-10<br>(50)<br>PB-10<br>(50)          | (n                                                             | 99                                                      | 04, A - A<br>30 CO<br>(A<br>80<br>              | 0<br>                    | ICE<br>rkmanshi p          | 32° to 1                                        | ER) OD<br>50°F noise<br>No oc    | lors         | CODESMET                                                                                                         | PERFORMA                                                         |                                              |                                                          | y filter-chem                                                                 | ical |

Fluidhearth-Physical-Chemical Treatment Plant, 206 AWT Systems, Inc. Aquanox-Controlled Oxidation Package Plant, 208 Aquanox, Inc. Sani-Cell-Activated Sludge Small Package Plant, 210 BiO<sub>2</sub> Systems, Inc. Tex-A-Robix-Extended Aeration Package Plant, 212 **Cantex Industries** Tex-A-Robic—Contact Stabilization Package Plant, 214 **Cantex Industries** TF-2 Tertiary Filters-Gravity-Type Filter-Backwash, 216 Cantex Industries Dravo Minipack-Trickling Filter Media Treatment Unit, 218 Dravo Corporation 3-Stage RBS-Rotating Biological Surface Package Plant, 220 Environmental Pollution Control Co., Inc. Extend-Aire-Diffused Air Extended Aeration Package Plant, 222 Extended Aeration Co. Batch-Treat-Modular Extended Aeration Package Plant, 224 **GAEA** Corporation Jet Package Plant-Aerobic Package Treatment Plant, 226 Jet Aeration Co. Activator-Diffused Air Package Plant, 228 Pollution Control, Inc. Puritrol-Batch Process Package Plant, 230 Pollutrol Technology, Inc. Purestream-Extended Aeration Package Plant, 232 Purestream Industrics, Inc. Marac-100-Mansard-Roofed Package Plant, 234 Suburbia Systems, Inc. DARAC-Diffused Air Extended Aeration Package Plant, 236 Suburbia Systems, Inc. Nonbiological Waste Treatment System-Shipboard Chemical, 238 Thiokol Chemical Corp.

# Introduction

This section contains a representative selection of sewage treatment plants in the 500 to 1 million gallon per day (gpd) range. Emphasis is on units ranging from about 2,000 to 50,000 gpd capacity, which corresponds to small clusters of about six homes to subdivisions of about 150 homes. While some of the units classified as package plants may overlap the size range of individual home aerobic treatment units, they are distinct in that they are not intended to be operated by the homeowner. A package treatment plant is considered to be a relatively self-contained unit which is intended for treating sewage from several to several hundred homes. Many of the units described in this section are available in more discrete capacity steps than could be shown on the standardized data sheets. The data sheets indicate a range of capacities, but do not cover all sizes.

Most of the units employ the extended aeration mode of the activated sludge process, though one uses the contact stabilization mode. At lease two manufacturers have designed treatment plants to fit shells of residential homes for unobtrusive operation in the midst of a residential area. One of these, designed for communities of from 200 to 4,000 housing units depends on physical and chemical processes entirely. It also incinerates the sludge. Another manufacturer of a non-biological system is presently concentrating on the shipboard market, but land-based units might be available in the future.

The biological disk variation of trickling filter operation (biological slime cultivated on a disk which rotates through a trough of sewage) is available from several manufacturers and is represented in this section. A more conventional trickling filter system for the 2,000 to 12,000 gpd range is also described. The unit employs a plastic matrix to support the biological slime.

A frequent arrangement for treating sewage in small communities uses lagoons or waste stabilization ponds. Sometimes, lagoons are used to provide further stabilization to the effluent from package plants. Lagoons also provide large evaporative surfaces which reduce the volumes of effluent that would have to be disposed in surface waters or in application directly to the land. Devices which promote aeration of wastes in lagoons are covered in a subsequent section ("Aeration Devices"). Lagoons themselves are custom-designed installations and are not specifically covered in this book.

### Cost

Manufacturers have generally been reluctant to quote prices, for competitive reasons. They have been even more reluctant to speculate about installation and operation and maintenance (O&M) costs. Beyond the list prices given in the data sheets, indications of installation and O&M costs should be interpreted as rough estimates only. A study of costs and manpower requirements for package plants is underway at the lowa State

University.\* It is expected that more definitive information will be available from that study in 1973.

On the basis of the list prices which were provided by some manufacturers, the following estimating relation was developed for the 2,000 to 50,000 gpd range:

 $C = 3,000 + A \cdot G$ 

where C is the suggested list price (dollars); G is the rated capacity (gpd) A ranges from \$0.35 to \$1.35 per rated gpd capacity

This means that when the list prices of package treatment plants are plotted against rated daily capacities, the various cost curves lie between two lines which represent costs of: (1) \$3,000 plus \$0.35 per gpd, and (2) \$3,000 plus \$1.35 per gpd. Most of the individual cost curves are linear, i.e., manufacturers tend to scale their prices in direct proportion to the capacities of the units.

An example of the use of this equation is as follows:

plant to 20,000 gpd rated capacity (= G);

minimum  $cost = \$3,000 + \$0.35 \times 20,000$ \$3,000 + \$7,000\$10,000;

maximum cost =  $3,000 + 1.35 \times 20,000$ 3,000 + 27,00030,000.

The list price of a 20,000-gpd plant would therefore range between \$10,000 and \$30,000.

### **Performance: The Imperative of Regular Maintenance**

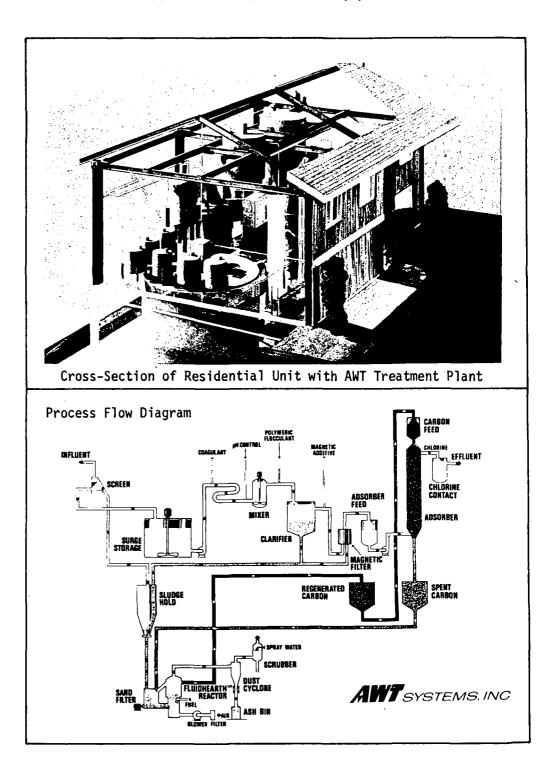
Most manufacturers claim treatment capabilities which are expressed in terms of reductions in biochemical oxygen demand (BOD) of around 90 per cent. Suspended solids (SS) reduction in the same range and chemical oxygen demand (COD) reduction of about 75 per cent are claimed by others. Such claims can be considered valid for properly installed and adjusted plants (in which mature cultures have been established, if the plants are biological). It is not likely that such optimum performance will be maintained without the regular attention of skilled operators. Regular attention includes routine

\*By George E. Lamp, Jr., Assistant Professor, Industrial Engineering—Engineering Extension, 110 Marston Hall, Iowa State University of Science and Technology, Ames, Iowa 50010.

inspection, preventive maintenance, and repair or adjustment of equipment which does not operate in accordance with specifications. Regular attention should also include periodic sampling of the effluent to verify the quality of treatment.

Some manufacturers furnish, along with their catalogue materials, guidance regarding simple visual checks for odor and appearance of the mixed liquor and effluent. Measurement of such other important parameters as dissolved oxygen (DO), SS, BOD, COD, chlorine residual (where chlorination is employed), and microbial concentrations (as often inferred from coliform counts or total viable counts) should be performed on a regular basis as required by state or local health or environmental protection authorities. Such tests are likely to require the services of specialists. The test values should be compared not only with state standards, but against historical data for the installation to ensure that the plant continues to perform properly.

As regards performance, therefore, a manufacturer's claim and certification by a testing laboratory such as the National Sanitation Foundation are important, but provisions for reliable, competent service on a regular schedule throughout the lifetime of the plant are every bit as important as initial certification. After the first few months or years, the plant will perform no better than the manner in which it is operated and serviced. If the consulting engineer and the client face this fact at the outset, a lot of money and much trouble can be saved. Unless qualified maintenance can be assured, it would be far better to trade treatment capability for simplicity and reliability.

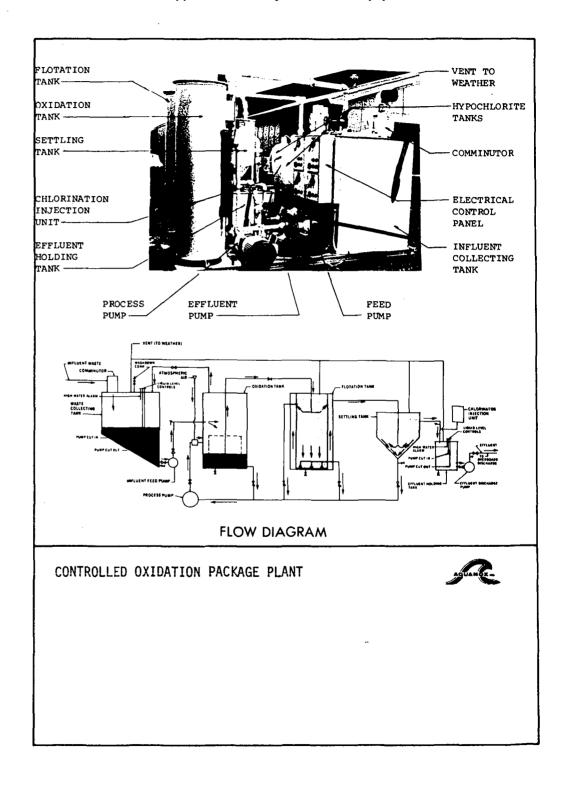


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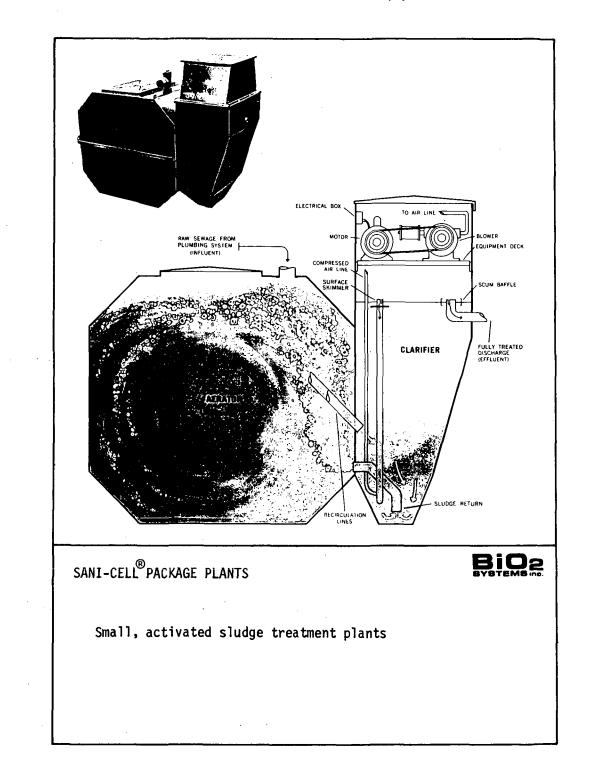
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| NODEL<br>UNBER<br>MAJORI                                                                              | LENGT                                                                           | T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                                                                | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                                                   | UTILITY REG                                                                                                  | UIRENENTS                                                                               | OPERATING<br>SUPPLIES                                                          |                     |
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                                                                                |                                                                                                                                                                | Required                                                                                                     |                                                                                         | See O&M<br>Below                                                               |                     |
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| str<br>leg<br>DSTS<br>1. Con                                                                          | engths<br>al cha<br>struct                                                      | ptable<br>of was<br>nges.<br>ion cos                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | stes or<br>sts of                                                           | i; can<br>' mudu'<br>about                                               | 1ar1ÿ<br>\$1.50                                                             | increas                           | ed to mee<br>1. of cap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | at types a<br>t process<br>acity.                            | nd<br>and                                                                                                | 1. Install<br>tank, w<br>PERATION<br>1. Single<br>2. 98% of                                                                                                                                                                       | ithin 100<br><b>&amp; MAINTE</b><br>employee w<br>problems r                                                                                                   | story house wi<br>ft. of adjacer<br>NANCE REQU<br>ould serve up<br>epaired on the                            | nt homes.<br>IREMENTS<br>to five pla                                                    | ants in an ar                                                                  | ea.                 |
| str<br>leg<br>OSTS<br>l. Con                                                                          | engths<br>al cha<br>struct<br>ration                                            | ptable<br>of wa:<br>nges.<br>ion co:<br>costs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | system<br>stes or<br>sts of<br>incluc                                       | a; can<br>- mudu'<br>about<br>de mate                                    | larlý<br>\$1.5(<br>erials                                                   | increase<br>D per ga<br>s and lat | ed to mee<br>1. of cap                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | t process                                                    | nd<br>and                                                                                                | 1. Installi<br>tank, w<br>PERATION<br>1. Single<br>2. 98% of<br>replace<br>3. Convent                                                                                                                                             | ed in two-<br>ithin 100<br>& MAINTE<br>employee w<br>problems r<br>ment of pa                                                                                  | story house wi<br>ft. of adjacer<br>NANCE REQU<br>ould serve up<br>epaired on the                            | IREMENTS<br>to five place<br>spot, 24                                                   | ants in an ar<br>to 48 hours f                                                 | ea.                 |
| str<br>leg<br>COSTS<br>1. Con<br>2. Ope                                                               | engths<br>al cha<br>struct<br>ration                                            | ptable<br>of wa:<br>nges.<br>ion co:<br>costs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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Installi<br>tank, w<br>PERATION<br>1. Single<br>2. 98% of<br>replace<br>3. Convent                                                                                                                                             | ed in two-<br>ithin 100<br><b>&amp; MAINTE</b><br>employee w<br>problems r<br>ment of pa<br>ionally av<br>es, etc.                                             | story house wi<br>ft. of adjacer<br>NANCE REQU<br>ould serve up<br>epaired on the<br>rts.                    | IREMENTS<br>to five place<br>spot, 24                                                   | ants in an ar<br>to 48 hours f                                                 | ea.                 |
| str<br>leg<br>COSTS<br>1. Con<br>2. Ope                                                               | engths<br>al cha<br>struct<br>ration                                            | ptable<br>of wa:<br>nges.<br>ion co:<br>costs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ng s                                                         | nd<br>and<br>O<br>Noise                                                                                  | <ol> <li>Installitank, w</li> <li>PERATION</li> <li>Single</li> <li>98% of<br/>replace</li> <li>Convent<br/>additiv</li> </ol>                                                                                                    | ed in two-<br>ithin 100<br>& MAINTE<br>employee w<br>problems r<br>ment of pa<br>ionally av<br>es, etc.                                                        | story house wi<br>ft. of adjacer<br>NANCE REQU<br>ould serve up<br>epaired on the<br>rts.                    | IREMENTS<br>to five place<br>spot, 24                                                   | ants in an ar<br>to 48 hours f                                                 | ea.                 |
| str<br>leg<br>OSTS<br>1. Con<br>2. Ope                                                                | engths<br>al cha<br>struct<br>ration<br>TEC                                     | ptable<br>of wa:<br>nges.<br>ion co:<br>costs<br>INICAL F<br>% REDUC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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Installitank, w<br>PERATION<br>1. Single<br>2. 98% of<br>replace<br>3. Convent<br>additiv<br>STANDARDS                                                                                                                         | ed in two-<br>ithin 100<br>& MAINTE<br>employee w<br>problems r<br>ment of pa<br>ionally av<br>es, etc.                                                        | story house wi<br>ft. of adjacer<br>NANCE REQU<br>ould serve up<br>epaired on the<br>rts.                    | IREMENTS<br>to five place<br>spot, 24                                                   | ants in an ar<br>to 48 hours f                                                 | ea.                 |
| Str<br>leg<br>OSTS<br>1. Con<br>2. Ope                                                                | engths<br>al cha<br>struct<br>ration<br>(R) =                                   | ptable<br>of wa:<br>nges.<br>ion co:<br>costs<br>INICAL F<br>% REDUC<br>St<br>(R)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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Installitank, w<br>PERATION<br>1. Single<br>2. 98% of<br>replace<br>3. Convent<br>additiv<br>STANDARDS                                                                                                                         | ed in two-<br>ithin 100<br>& MAINTE<br>employee w<br>problems r<br>ment of pa<br>ionally av<br>es, etc.                                                        | story house wi<br>ft. of adjacer<br>NANCE REQU<br>ould serve up<br>epaired on the<br>rts.                    | IREMENTS<br>to five place<br>spot, 24                                                   | ants in an ar<br>to 48 hours f                                                 | ea.                 |
| Str<br>leg<br>OSTS<br>1. Con<br>2. Ope                                                                | engths<br>al cha<br>struct<br>ration<br>(R) =                                   | ptable<br>of wa:<br>nges.<br>ion co:<br>costs<br>INICAL F<br>% REDUC<br>St<br>(R)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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<li>STANDARCE</li> </ol>                    | ed in two-<br>ithin 100<br>& MAINTEE employee w problems r ment of oa ionally av es, etc.                                                                      | story house wi<br>ft. of adjacer<br>NANCE REQU<br>ould serve up<br>epaired on the<br>rts.                    | IREMENTS<br>to five place<br>spot, 24                                                   | ants in an ar<br>to 48 hours f                                                 | ea.                 |
| str<br>leg<br>OSTS<br>1. Con<br>2. Ope<br>MADOFL<br>UMBER<br>MAJORI<br>ANT<br>ANT<br>1. AWT<br>2. AWT | reciptors<br>al cha<br>istruct<br>ration<br>(R -<br>95<br>95<br>NTIES,<br>provi | HINCAL F<br>S REDUC<br>S RES<br>S REDUC<br>S RE | System<br>step of<br>includ<br>PERFORM<br>DO<br>ANTEE<br>1 Opera<br>nt pers | about<br>about<br>ie mate<br>coo<br>1;<br>coo<br>1;<br>s, & SI<br>sone i | S1.50<br>S1.50<br>DUTPUT<br>AL VAL<br>98<br>98<br>Phospl<br>ERVIC<br>and ma | D per ga<br>s and Tal             | OPERATI<br>RAMGE<br>TELMO<br>OPERATI<br>RAMGE<br>TELMO<br>OPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI | NG V<br>NG V<br>NG V<br>NG V<br>NG V<br>NG V<br>NG V<br>NG V | nd<br>end<br>orise<br>pors<br>se.<br>odors<br>odors<br>to<br>noxio                                       | 1. Install<br>Lank, w<br>PERATION<br>1. Single 2.<br>983 of<br>replace<br>3. Convent<br>additiv<br>STANDARCE<br>CODES MET                                                                                                         | ed in two-<br>ithin 100<br>& MAINTEE employee w problems r ment of oa tonally av es, etc.<br>s<br>PERFORM ater meets                                           | story house wi<br>ft. of adjacer<br>NANCE REQU<br>Duld serve up<br>epaired on the<br>rds.<br>ailable suppli  | IR EMENTS                                                                               | ants in an ar<br>to 48 hours f<br>rs. magnetic                                 | ea .<br>or          |
| str<br>leg<br>OSTS<br>1. Con<br>2. Ope<br>MADOFL<br>UMBER<br>MAJORI<br>ANT<br>ANT<br>1. AWT<br>2. AWT | reciptors<br>al cha<br>istruct<br>ration<br>(R -<br>95<br>95<br>NTIES,<br>provi | HINCAL F<br>S REDUC<br>S RES<br>S REDUC<br>S RE | System<br>step of<br>includ<br>PERFORM<br>DO<br>ANTEE<br>1 Opera<br>nt pers | about<br>about<br>ie mate<br>coo<br>1;<br>coo<br>1;<br>s, & SI<br>sone i | S1.50<br>S1.50<br>DUTPUT<br>AL VAL<br>98<br>98<br>Phospl<br>ERVIC<br>and ma | D per ga<br>s and lal             | OPERATI<br>RAMGE<br>TELMO<br>OPERATI<br>RAMGE<br>TELMO<br>OPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI<br>COPERATI | NG V<br>NG V<br>NG V<br>NG V<br>NG V<br>NG V<br>NG V<br>NG V | nd and O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O<br>O       | <ol> <li>Install-<br/>Lank, w</li> <li>PERATION</li> <li>Single -</li> <li>983 of<br/>replace</li> <li>Convent<br/>additiv</li> <li>STANDARCE</li> <li>CODES MET</li> <li>Standarce</li> <li>COMMENTS</li> <li>ANT sys</li> </ol> | ed in two-<br>ithin 100<br>& MAINTE<br>employee w<br>problems r<br>ment of paint<br>ionally aves, etc.<br>s<br>s.<br>PERFORM<br>ater meets<br>d.<br>tems efflu | story house wi<br>ft. of adjacer<br>NANCE REQU<br>build serve up<br>epaired on the<br>rts.<br>ailable suppli | IREMENTS<br>to five pla<br>to five pla<br>fes: polyment<br>fes: polyment<br>Health Ser- | ants in an ar<br>to 48 hours f<br>rs, magnetic<br>vice potabili<br>July 31, 15 | ea.<br>or<br><br>ty |

207

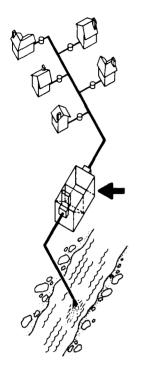


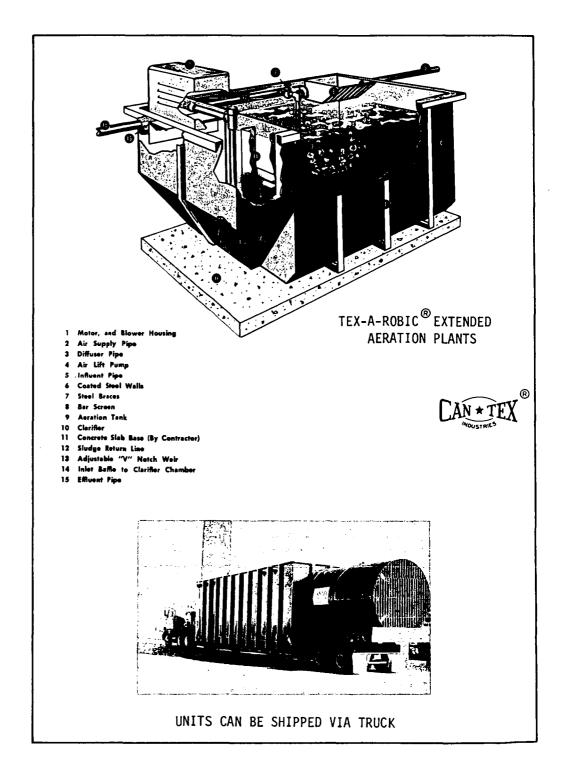
|                                                                     | 01) 947                                                                                           | 00D CI<br>-2477                                                               | IFFS, I                                                                                                      |                                                                                                       | RSEY 07(                                            |                                                                                              |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                          |                                                                                                                             | co                                                                                 | AQUA<br>INTROLLED<br>PACKAGI                                               | OXIDATION                                       |                   |
|---------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------|-------------------|
| pl<br>2. In<br>3. No<br>ra<br>4. Li<br>an<br>5. Fo                  | ontrolle<br>ant proc<br>fluent c<br>n-biolog<br>te for t<br>quid lev<br>d feed s                  | cesses :<br>collect<br>gical tr<br>collance<br>vel con<br>sewage a<br>ls from | sewage<br>ing tan<br>reatmen<br>d treatu<br>trols au<br>t cons<br>500 to                                     | in 1-1/2<br>k holds<br>t siphor<br>ment.<br>nd high<br>tant rat<br>5000 GF                            | thours.<br>300% of<br>is air in<br>water al<br>ies. | nt in steel<br>hourly cap<br>nto wastes<br>larms safec<br>ible with c                        | acity<br>at co<br>guard                  | /.<br>onstant<br>system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2. Influe<br>move to<br>of tar<br>3. Solids<br>proces<br>4. Skimme                                       | nuted waste<br>to oxidation<br>ant pumped in<br>to the outsi<br>the to flotat<br>from oxida<br>s pump thro<br>ers and sluce | tank.<br>n tangential<br>de, screened<br>ion tank.<br>tion tank an<br>ugh air indu | flow in oxi<br>water is re<br>d other part<br>ction device<br>perate, sewa | ge is clarif                                    | so<br>ent<br>ed . |
|                                                                     | <u> </u>                                                                                          |                                                                               |                                                                                                              | <del>.</del>                                                                                          |                                                     | <del></del>                                                                                  | <b>T</b>                                 | _                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <u> </u>                                                                                                 |                                                                                                                             | <del></del>                                                                        |                                                                            |                                                 | ÷-                |
| NODEL<br>NUMBER<br>(MAJOR)                                          | с<br>LENGTH                                                                                       | WIDTH                                                                         | HEIGHT                                                                                                       | WEIGHT                                                                                                | RATED<br>CAPACITY<br>(GPD)                          | TANK<br>CAPACITY<br>(GAL.)                                                                   | SUGG<br>(Fi                              | LIST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DOLLARS                                                                                                  | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                | ELECTRICITY<br>(RATING)                                                            | WATER<br>PRESSURE                                                          | OPERATING<br>SUPPLIES                           |                   |
| 400                                                                 | 5'                                                                                                | 4'                                                                            | 3'6"                                                                                                         | 1300                                                                                                  | 500                                                 |                                                                                              | \$ 7.                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                          | 15-20                                                                                                                       | 110, 220/<br>440 V<br>3 ph                                                         | 40 PS1 <sup>1</sup>                                                        | Chlorine                                        | t                 |
| 401                                                                 | 1'                                                                                                | 5'                                                                            | 4'                                                                                                           | 1700                                                                                                  | 1 500                                               |                                                                                              |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ca<br>1.75/da                                                                                            | ıy "                                                                                                                        |                                                                                    | "                                                                          |                                                 |                   |
| 402                                                                 | 8'2"                                                                                              | 5'                                                                            | 4'                                                                                                           | 2300                                                                                                  | 2500                                                |                                                                                              |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                          |                                                                                                                             |                                                                                    | u                                                                          |                                                 | L                 |
| 403                                                                 | 10'6"                                                                                             | 5'                                                                            | 7'                                                                                                           | 4600                                                                                                  | 5000                                                | <u> </u>                                                                                     | \$19                                     | 500.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ca<br>3.50/da                                                                                            | ly "                                                                                                                        | u                                                                                  |                                                                            |                                                 | L                 |
| al<br>COSTS<br>1. In                                                | low cons<br>itial ca                                                                              | itant f                                                                       | low into                                                                                                     | o treatm                                                                                              | ient tank                                           | s:<br>\$1,25to \$7.                                                                          |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | and st<br>2. Electr                                                                                      | ground inst<br>art-up.<br>rical skills                                                                                      | allation; ma                                                                       | 1-day instal<br>UIREMENTS                                                  | oversees insta<br>lation proces<br>s automatic. |                   |
| al<br>COSTS<br>1. In<br>ser<br>2. Opt                               | low cons<br>itial ca<br>vage tre                                                                  | itant f<br>pital :<br>ated.<br>costs i                                        | low into<br>investme<br>for 403                                                                              | o treatm<br>ents ram                                                                                  | ient tank<br>ige from                               | s.                                                                                           | .00/ga                                   | 11.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1. Above<br>and st<br>2. Electr<br>OPERATION<br>1. Period                                                | ground inst<br>art-up.<br>rical skills                                                                                      | allation; ma<br>needed for<br>NANCE RECH                                           | 1-day instal<br>UIREMENTS                                                  | lation proces                                   |                   |
| al<br>COSTS<br>1. In<br>set<br>2. Opt<br>25:<br><br>MODEL<br>NUMBER | low cons<br>itial ca<br>wage tre<br>erating<br>t/day fo                                           | itant f<br>upital :<br>costs i<br>or chlor<br>NICAL PE                        | investm<br>for 403<br>fine.                                                                                  | o treatm<br>ents ram                                                                                  | nge from<br>ed on 10                                | s.<br>\$1.25to \$7.<br>8 Kwh/day<br>OPERATII<br>RANGES                                       | .00/ga<br>@3¢/                           | 11.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1. Above<br>and st<br>2. Electr<br>OPERATIOI<br>1. Period                                                | ground inst<br>art-up.<br>fcal skills<br>N & MAINTE<br>fic maintena                                                         | allation; ma<br>needed for<br>NANCE RECH                                           | 1-day instal<br>UIREMENTS                                                  | lation proces                                   |                   |
| al<br>COSTS<br>1. In<br>set<br>25.<br>25.<br>25.<br>25.             | low cons<br>itial ca<br>wage tre<br>erating<br>t/day fo<br>TECH<br>(R - %<br>(R) 5                | itant f<br>apital s<br>ated.<br>costs f<br>or chlor<br>NICAL PE               | investan<br>for 403<br>fine.<br>RFORMAJ<br>ION, A - /                                                        | ents ran<br>are bas                                                                                   | nge from<br>ed on 10                                | is .<br><b>\$1,25</b> to <b>\$</b> 7.<br>8 Кwh/day<br>ОРЕВАТИ                                | 00/ga<br>@3¢/<br>NG<br>\$                | il.<br>'Kwh and<br>NOISI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1. Above<br>and si<br>2. Electr<br>OPERATIOI<br>1. Perioc<br>STANDAR<br>S COOES MI<br>Patents<br>Fatents | ground inst<br>art-up.<br>-ical skills<br>N & MAINTE<br>Dic maintena<br>Dos                                                 | allation; ma<br>needed for<br>NANCE RECH                                           | 1-day instal<br>UIREMENTS                                                  | lation proces                                   |                   |
| al<br>COSTS<br>1. In<br>see<br>2. Opp<br>250<br>                    | low cons<br>itial ca<br>wage tre<br>erating<br>t/day fo<br>TECH<br>(R - %<br>(R) 5                | itant f<br>apital s<br>ated.<br>costs f<br>r chlor<br>NICAL PE<br>(R)         | investan<br>for 403<br>fine.<br>RFORMAJ<br>ION, A - /                                                        | o treatm<br>ents ran<br>are bas<br>wce-ourper<br>wce-ourper<br>wce-ourper<br>wce-ourper<br>wce-ourper | nge from<br>ed on 10                                | S.<br>\$1.25to \$7.<br>Кић/day<br>СРЕВАТИ<br>В Акић/day<br>СРЕВАТИ<br>В Акић/day<br>28–120°F | 00/ga<br>@3¢/<br>NG<br>\$                | NOISE<br>NOISE<br>NOISE<br>Minor<br>noise.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1. Above<br>and si<br>2. Electr<br>OPERATIOI<br>1. Perioc<br>STANDAR<br>S COOES MI<br>Patents<br>Fatents | ground inst<br>art-up.<br>-ical skills<br>N & MAINTE<br>Dic maintena<br>Dos                                                 | allation; ma<br>needed for<br>NANCE RECH                                           | 1-day instal<br>UIREMENTS                                                  | lation proces                                   |                   |
| a1<br>. COSTS<br>1. In<br>. Se<br>. 2. OP<br>. 25                   | low cons<br>itial ca<br>avage treating<br>(/ av fc<br>from<br>90-96<br>90-96<br>90-96<br>NNTIES.Q | ipital ::<br>ated.<br>costs :<br>r choi<br>nical PE<br>security<br>90-95      | Iow intri<br>investment<br>for 403<br>rine.<br>ARCONMANT<br>ION, A = /<br>DO<br>Q<br>I<br>ION A = /<br>ION Q | ents ran<br>are bas<br>wce ourpe<br>corrual v.<br>75+                                                 | ICE                                                 | S.<br>\$1.25to \$7.<br>Кић/day<br>СРЕВАТИ<br>В Акић/day<br>СРЕВАТИ<br>В Акић/day<br>28–120°F | 00/ga<br>8 3¢/<br>NG<br>8 (ER)<br>Troom) | Notes and a second seco | 1. Above<br>and st<br>2. Electric<br>OPERATIOI<br>1. Perioc<br>Patents<br>rs.<br>TECHNICAI<br>1. New Yc  | ground inst<br>art-Up.<br>It cal skills<br>N & MAINTE<br>It maintend<br>os<br>st<br>it<br>iding                             | allation; ma<br>needed for<br>NANCE REQU<br>nce program,                           | 1-day instal<br>UIREMENTS<br>operation i<br>project No.                    | lation proces                                   |                   |

n



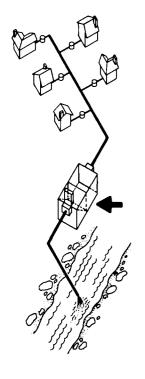
|                                                                                          | 16) 756                                                                                              | CITY, M<br>-1450                                                                               |                                                                                                  | RI 6410<br>wrt, Presi                                                                   |                                                                                                         |                                                |                                        |                                                                                                                                                                                                                                                                                                                                    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| 2. De:<br>pei<br>3. Un<br>gai<br>epi<br>4. Aei<br>5. Sk<br>6. Moi<br>7. Ch               | tal mix<br>signed f<br>rson/day<br>its exce<br>uge shee<br>by res<br>ration f<br>immer in<br>del 550 | for 100<br>y organ<br>ept Mod<br>et stee<br>in (ext<br>from of<br>n clari<br>has fi<br>contact | GPCD hi<br>ic load<br>el 550<br>l; sandl<br>ra cost<br>l-less f<br>fier chi<br>berglas<br>chambe | ydraulic<br>ing.<br>(fits in<br>blasted<br>).<br>compress<br>amber.<br>s clarif         | : loading<br>n concret<br>and cove<br>ed air b<br>Tier inse                                             |                                                | 16. BOD5<br>ade of 12<br>coal tar      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | activat<br>2. Aeratio<br>BOD5 lo<br>3. Mixed l<br>skimmed<br>partmen                                                                                                                                                  | t enters a<br>ed sludge.<br>n supplied<br>ading.<br>iquor goes<br>; settled<br>t; superna<br>ction is w                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | to yield 1.2<br>to clarifier<br>sludge and so<br>tant flows ou                                                                                                                                                                                                                               | 25 lb. disso<br>where floc<br>cum returned<br>it over wein                                                                                                                                                             | : is mixed wi<br>olved O <sub>2</sub> per  <br>: settles; sc<br>i to aeration<br>orite, e.g.,                                                                                                 | pound<br>um is                                                                                |
|                                                                                          | r .                                                                                                  | DIMENSIO                                                                                       |                                                                                                  | <u> </u>                                                                                | <b>—</b> —                                                                                              |                                                |                                        | OSTS (DO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                        | 1                                                                                                                                                                                             | Г                                                                                             |
| NODEL<br>NUMBER<br>IMAJORI                                                               | LENGTH                                                                                               | 1                                                                                              | HEIGHT                                                                                           | WEIGHT<br>(LB.)                                                                         | RATED<br>CAPACITY<br>(GPD)                                                                              | CAPACITY                                       | SUGG. LIST<br>(FOB<br>FACTORY          | INSTA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                       | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ELECTRICITY<br>(RATING)                                                                                                                                                                                                                                                                      | BLOWER                                                                                                                                                                                                                 |                                                                                                                                                                                               | FLO<br>LO/<br>FII                                                                             |
| 550                                                                                      | 95"                                                                                                  | 48''                                                                                           | 90"                                                                                              |                                                                                         | 600                                                                                                     | 780                                            | 875 <sup>2</sup><br>+ 540 <sup>3</sup> | ' <u>+</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | See<br>Costs<br>below                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 120 V<br>60 Hz<br>1 ph                                                                                                                                                                                                                                                                       | 1/3 HP<br>9 CFM                                                                                                                                                                                                        | 1                                                                                                                                                                                             | <u> </u>                                                                                      |
| 600                                                                                      |                                                                                                      | 47"                                                                                            | 80"                                                                                              | 1000<br>ship'g                                                                          |                                                                                                         | 1600                                           | 1375<br>+ 1079 <sup>3</sup>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                                                                                                                                                                                    | "                                                                                                                                                                                                                                                                                            | "                                                                                                                                                                                                                      |                                                                                                                                                                                               | 500<br>50                                                                                     |
| 1200                                                                                     |                                                                                                      | 84"                                                                                            | 81"                                                                                              | 3000<br>ship'g                                                                          | 1200                                                                                                    | 1200                                           | 2250<br>+ 1202 <sup>3</sup>            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                                                                                                                                                                                    | "                                                                                                                                                                                                                                                                                            | 3/4 HP<br>20 CF₩                                                                                                                                                                                                       |                                                                                                                                                                                               |                                                                                               |
|                                                                                          | 1                                                                                                    | 95"                                                                                            | 104"                                                                                             | 5000<br>ship'q                                                                          | 2800                                                                                                    | 2800                                           | 4120<br>+ 1872 <sup>3</sup>            |                                                                                                                                                                                                                                                                                                                                    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                                                                                                                                                                                                                                                    | 115 V<br>60 Hz<br>1 ph                                                                                                                                                                                                                                                                       | 1 HP<br>30 CFM                                                                                                                                                                                                         |                                                                                                                                                                                               | 550<br>s c                                                                                    |
| SIZING                                                                                   | & GROV                                                                                               | al pric<br>VTH PO                                                                              | <u>es incl</u> i<br>TENTIA                                                                       | ude all                                                                                 | <u>extras a</u>                                                                                         | and clarif<br><u>nd accesso</u><br>rost refri  | ories, e <sub>t</sub>                  | a., big                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ger motors.<br>INSTALLATI<br>1. Require<br>possibl<br>2. Half-fi<br>3. Bury be<br>OPERATION<br>1. Routine                                                                                                             | heavier st<br>ON REQUI<br>leveling;<br>y a cement<br>ll all com<br>low freezi<br>& MAINTE<br>check for                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | REMENTS<br>larger units<br>pad; rock-fi<br>partments with<br>ng level.<br>NANCE REQU<br>color, odor.                                                                                                                                                                                         | ator, alarms<br>s will requi<br>ree backfill<br>th water to<br><b>JIREMENTS</b>                                                                                                                                        | in <u>inlet scre</u><br>re foundatio<br>, preferably<br>prevent shif<br>on skimmer a                                                                                                          | n.<br>sand<br>ting:                                                                           |
| 3 <sub>A</sub><br>Sizing                                                                 | dditiona<br>& GROW                                                                                   | al pric<br>VTH PO                                                                              | <u>es incl</u> i<br>TENTIA                                                                       | ude all                                                                                 | <u>extras a</u>                                                                                         | nd accesso                                     | ories, e <sub>t</sub>                  | a., big                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <pre>ger motors.<br/>INSTALLATI<br/>1. Require<br/>possibl<br/>2. Half-fi<br/>3. Bury be<br/>OPERATION<br/>1. Routine<br/>2. After p<br/>clarifi<br/>3. Intermi<br/>moistur</pre>                                     | heavier st<br>ON REQUI<br>leveling;<br>y a cement<br>11 all com<br>low freezi<br>& MAINTE<br>check for<br>rolonged s<br>er must be<br>ttent load                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | eel, chloring<br>REMENTS<br>larger units<br>pad; rock-fi<br>partments wii<br>ng level.<br>NANCE REOU<br>color, odor.<br>hutdown, drig<br>removed.<br>adapter avai                                                                                                                            | ator, alarms<br>s will requin<br>ree backfill<br>th water to<br><b>JIREMENTS</b><br>ed deposits<br>Hable (opti                                                                                                         | re foundatio<br>, preferably<br>prevent shif                                                                                                                                                  | n.<br>sand<br>ting:<br>nd fu<br>lace                                                          |
| 3 <sub>A</sub><br>SIZING<br>COSTS<br>1. Opt                                              | dditiona<br>& GROW<br>erating<br>(R - 3                                                              | al pric<br>VTH PO<br>costs                                                                     | <u>es inc]</u><br>TENTIA<br>similar<br>RFORMAL                                                   | to big                                                                                  | <u>extras a</u><br>self-def<br>ur<br>ALUEI                                                              | nd accesso<br>rost refri<br>OPERATII<br>RANGES | ories, e,<br>igerator.<br>NG           | Q. Dic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <pre>ger motors.<br/>INSTALLATI<br/>1. Require<br/>possibl<br/>2. Half-fi<br/>3. Bury be<br/>OPERATION<br/>1. Routine<br/>2. After p<br/>clarifi<br/>3. Intermi<br/>moistur<br/>weekend<br/>\$TANDARD\$</pre>         | heavier st<br>ON REQUI<br>leveling;<br>y a cement<br>11 all com<br>low freezi<br>& MAINTE<br>check for<br>rolonged s<br>er must be<br>ttent load<br>e lost bet<br>s, etc.).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | eel, chloring<br>REMENTS<br>larger units<br>pad; rock-fi<br>partments wii<br>ng level.<br>NANCE REOU<br>color, odor.<br>hutdown, drig<br>removed.<br>adapter avai                                                                                                                            | ator, alarms<br>s will requi<br>ree backfill<br>th water to<br><b>JIREMENTS</b><br>ad deposits<br>ilable (opti<br>s (for vacat                                                                                         | on skimmer a                                                                                                                                                                                  | n.<br>sand<br>tings<br>nd fr<br>lace                                                          |
| 3 <sub>A1</sub><br>SIZING<br>COSTS<br>1. 0p4                                             | dditiona<br>& GROW<br>erating<br>(R+3<br>BOD6<br>(R)                                                 | al pric<br>VTH PO<br>costs                                                                     | <u>es inc]</u><br>TENTIA<br>similar<br>RFORMAL                                                   | to big                                                                                  | <u>extras a</u><br>self-def                                                                             | nd accesso<br>rost refri                       | igerator.                              | q., bic<br>Noise<br>books<br>oriess<br>en<br>erating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ger motors<br>INSTALLATI<br>I. Require<br>possibl<br>2. Half-fi<br>3. Bury be<br>OPERATION<br>1. Routine<br>2. After p<br>clarifi<br>3. Intermi<br>moistur<br>weekend<br>STANDARD<br>CODES MET<br>NSF: see<br>general | heavier st<br>ON REQUI<br>leveling;<br>y a cement<br>low freezi<br>& MAINTE<br>check for<br>rolonged s<br>e lost bet<br>s, etc.)<br>GEN<br>Line (Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>(Construction)<br>( | eel, chlorin;<br>REMENTS<br>larger unit:<br>pad; rock-fi<br>partments wii<br>ng level.<br>NANCE REOU<br>color, odor,<br>nutdown, dri<br>hutdown, dri<br>hutdown, dri<br>hutdown, dri<br>emoved.<br>adapter ava<br>ween loadings<br>ERAL COMMENTS<br>EFfluent safe<br>BOD <sub>5</sub> and SS | stor, alarms<br>s will requi-<br>ree backfill<br>th water to<br>JIREMENTS<br>ad deposits<br>ilable (opti<br>s (for vacal<br>f to normal)<br>f to normal)                                                               | re foundatio<br>, preferably<br>prevent shif<br>on skimmer a<br>onal) to rep<br>tion hores us<br>y contain 20<br>s and 10 mg/                                                                 | n,<br>sanc<br>tings<br>nd fr<br>lace<br>ed or<br><br>mg/l<br>1 for                            |
| 3 <sub>A</sub><br>SIZING<br>COSTS<br>1. Opt<br>NUMBER<br>(MAJORI                         | dditiona<br>& GROW<br>erating<br>(R+3<br>BOD6<br>(R)                                                 | al pric<br>VTH PO<br>costs                                                                     | <u>es inc]</u><br>TENTIA<br>similar<br>RFORMAL                                                   | to big                                                                                  | extras a<br>self-def<br>self-def<br>int<br>int<br>ecople                                                | nd accesso<br>rost refri<br>OPERATII<br>RANGES | igerator.                              | q., bic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ger motors<br>INSTALLATI<br>I. Require<br>possibl<br>2. Half-fi<br>3. Bury be<br>OPERATION<br>1. Routine<br>2. After p<br>clarifi<br>3. Intermi<br>moistur<br>weekend<br>STANDARD<br>CODES MET<br>NSF: see<br>general | heavier st<br>ON REQUI<br>leveling;<br>y a cement<br>ll all com<br>low freezi<br>& MAINTE<br>check for<br>rolonged s<br>er must be<br>ttent load<br>e lost bet<br>s, etc.).<br>GEN<br>l.<br>2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | eel, chlorin;<br>REMENTS<br>larger unit:<br>pad; rock-fi<br>partments win<br>ng level.<br>NANCE REO(<br>color, odor,<br>removed.<br>adapter avai<br>ween loadings<br>eRAL COMMENTS<br>Effluent sais<br>800g and SS i<br>both in resto<br>maturing of i<br>Successfully                       | ator, alarms<br>s will require backfill<br>th water to<br>JIREMENTS<br>ad deposits<br>ilable (opti<br>s (for vacal<br>f to normall<br>in lab trial<br>fential test<br>iludge.<br>tested one                            | re foundatio<br>, preferably<br>prevent shif<br>on skimmer a<br>onal) to rep<br>ion hores us<br>y contain 20                                                                                  | n, sand<br>ting:<br>nd fr<br>lace<br>ed or<br>                                                |
| 3 <sub>A</sub> ,<br>SIZING<br>COSTS<br>1. Opt<br>NUMBER<br>(MAJORI<br>550                | erating<br>TECH<br>(R = 3<br>BOD 6<br>IR16<br>Ca 95                                                  | costs                                                                                          | <u>es inc]</u><br>TENTIA<br>similar<br>RFORMAL                                                   | to big<br>wcc.outry<br>kctual v.<br>oo TR<br>6 p<br>0 1<br>12<br>0 1                    | extras a<br>self-def<br>self-def<br>lEATS<br>in-<br>people<br>00 GPD<br>"<br>people<br>00 GPD<br>00 GPD | nd accesso<br>rost refri<br>OPERATII<br>RANGES | igerator.                              | q., bic<br>Noise<br>books<br>oriess<br>en<br>erating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ger motors<br>INSTALLATI<br>I. Require<br>possibl<br>2. Half-fi<br>3. Bury be<br>OPERATION<br>1. Routine<br>2. After p<br>clarifi<br>3. Intermi<br>moistur<br>weekend<br>STANDARD<br>CODES MET<br>NSF: see<br>general | heavier st<br>ON REQUI<br>leveling;<br>y a cement<br>li all com<br>low freezi<br>& MAINTE<br>check for<br>rolonged s<br>er must be<br>ttent load<br>e lost bet<br>s, etc.)<br>GEN<br>2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | eel, chlorin;<br>REMENTS<br>larger unit:<br>pad; rock-fi<br>partments win<br>ng level.<br>NANCE REOU<br>color, odor.<br>nutdown, dria<br>removed.<br>adapter avai<br>ween loadings<br>EFFluent safic<br>EFFluent safic<br>south in resign<br>at national S<br>successfully<br>at National S  | ator, alarms<br>s will require backfill<br>th water to<br>JIREMENTS<br>ad deposits<br>ilable (opti<br>s (for vacal<br>f to normall<br>in lab trial<br>solutge.<br>anttal test<br>sludge.<br>extended ar<br>extended ar | re foundatio<br>, preferably<br>prevent shif<br>on skimmer a<br>ional) to rep<br>ion homes us<br>y contain 20<br>s and 10 mg/<br>s after 3 we<br>rodel (Model                                 | n, san<br>san<br>ting<br>nd fu<br>lace<br>ed or<br>mg/<br>l for<br>eks<br>600<br>nder<br>ge   |
| 3 <sub>A.</sub><br>SIZING<br>COSTS<br>1. Opt<br>MODEL<br>NUMBER<br>(MAJORI<br>550<br>600 | erating<br>TECH<br>(R - 5<br>BOD 6<br>                                                               | costs                                                                                          | <u>es inc]</u><br>TENTIA<br>similar<br>RFORMAL                                                   | to big<br>NCE-OUTFI<br>NCE-OUTFI<br>NCE-OUTFI<br>CETUAL V.<br>00 TR<br>6 p<br>0 1<br>28 | extras a<br>self-def<br>self-def<br>in:<br>in:<br>in:<br>in:<br>in:<br>in:<br>in:<br>in:<br>in:<br>in:  | nd accesso<br>rost refri<br>OPERATII<br>RANGES | ngerator.                              | And the second s | ger motors<br>INSTALLATI<br>I. Require<br>possibl<br>2. Half-fi<br>3. Bury be<br>OPERATION<br>1. Routine<br>2. After p<br>clarifi<br>3. Intermi<br>moistur<br>weekend<br>STANDARD<br>CODES MET<br>NSF: see<br>general | heavier st<br>ON REQUI<br>leveling;<br>y a cement<br>li all com<br>low freezi<br>& MAINTE<br>check for<br>rolonged s<br>er must be<br>ttent load<br>e lost bet<br>s, etc.)<br>GEN<br>2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | eel, chlorin;<br>REMENTS<br>larger unit:<br>pad; rock-fi<br>partments win<br>ng level.<br>NANCE REOU<br>color, odor.<br>nutdown, dria<br>removed.<br>adapter avai<br>ween loadings<br>EFFluent safic<br>EFFluent safic<br>south in resign<br>at national S<br>successfully<br>at National S  | ator, alarms<br>s will require backfill<br>th water to<br>JIREMENTS<br>ad deposits<br>ilable (opti<br>s (for vacal<br>f to normall<br>in lab trial<br>solutge.<br>anttal test<br>sludge.<br>extended ar<br>extended ar | re foundatio<br>, preferably<br>prevent shif<br>on skimmer a<br>ional) to rep<br>ion homes us<br>y contain 20<br>s and 10 mg/<br>s after 3 we<br>rodel (Model<br>oundation, u<br>ration packa | n, sand<br>ting:<br>nd fr<br>lace<br>ed or<br>mg/i<br>for<br>for<br>sets<br>600<br>nder<br>ge |

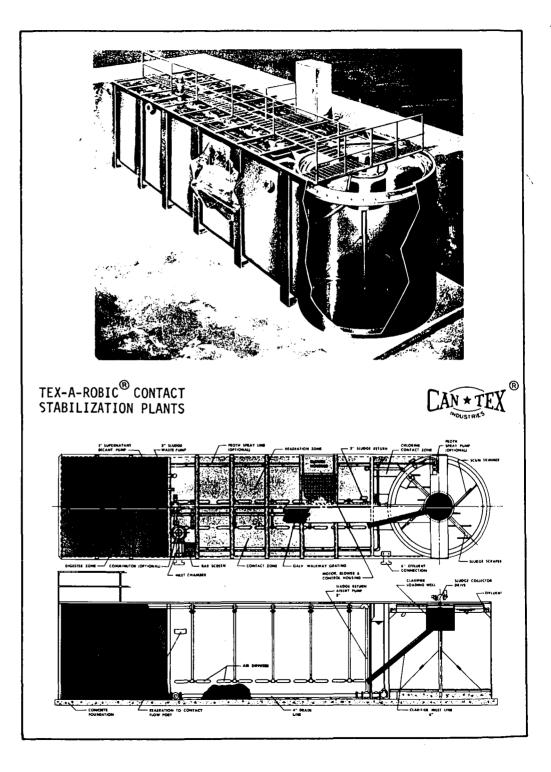




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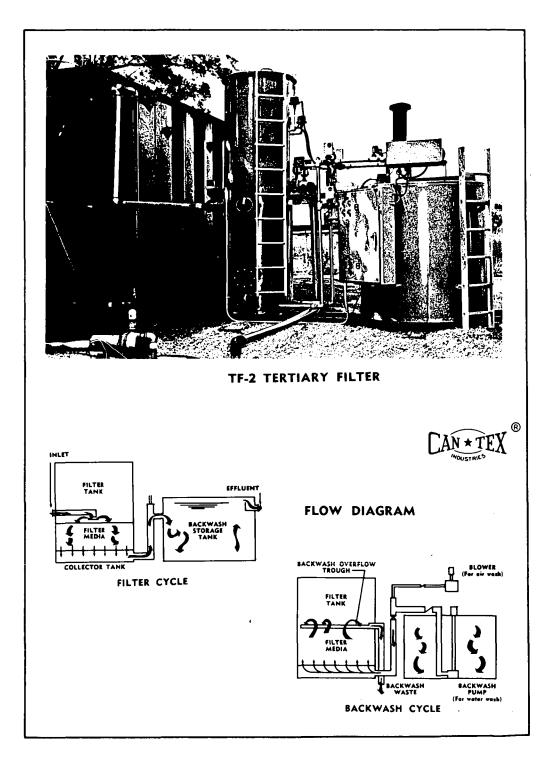
|                                                                                      | _                                                                                                    |                                                                  |                                                      |                                                        |                                    |                                                                                              | s Equipment                                                             |                          |                                                                                                                                                           |                                                                                                                              |                                                                                                                                            | ACKAGE PI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                       | _            |
|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------|------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------|
| 25<br>2. Two<br>3. Di<br>4. In<br>5. Gro                                             | e-fabric<br>000 GPE<br>chambe<br>ffused a<br>let baff                                                | ) capaci<br>red uni<br>leration<br>le betw<br>way on             | ity.<br>it: aera<br>with a<br>ween aer<br>clarifi    | tion ta<br>ir-lift<br>ation t<br>ier, bar              | nk and cl<br>sludge r<br>ank and c | arifier.<br>eturns ar<br>larifier.                                                           | rom 5,000 ta<br>nd skimmers<br>magnesium                                |                          | <ol> <li>Influen<br/>clarifi</li> <li>Solids<br/>sludge</li> <li>Superna</li> </ol>                                                                       | t is aerat<br>er.<br>settle, sl<br>"air-lifte                                                                                | ation chamber<br>ed, flows by<br>udge return o<br>d" to inlet f<br>arifier flows                                                           | velocity re<br>perates, se<br>or treatmen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ducing baffle<br>ttled-activat<br>t cycling.                          | ed           |
|                                                                                      | <b>_</b>                                                                                             | HINE NELO                                                        |                                                      | 1                                                      |                                    |                                                                                              | cor                                                                     | 3 (001.L                 | AR3)                                                                                                                                                      |                                                                                                                              | UTILITY REG                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | T                                                                     | -            |
| MODEL<br>NUMBER<br>(MAJOR)                                                           | LENGTH                                                                                               | WIDTH                                                            | HENGHT                                               | WEIGHT<br>(LB.)                                        | RATED<br>CAPACITY<br>(GPD)         | TANK<br>CAPACITY<br>KGALJ                                                                    | SUGG. LIST<br>(FOB                                                      | NETALL                   | · · · ·                                                                                                                                                   | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                 | ELECTRICITY                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | OPERATING<br>SUPPLIES                                                 | 8            |
| 50M                                                                                  | 13' 5"                                                                                               | 8'                                                               | 11"                                                  | 8700                                                   | 5,000                              | 5,833                                                                                        | 7,250.                                                                  | aries                    |                                                                                                                                                           | 20                                                                                                                           | 115/230 V<br>AC - blower                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Chlorine,<br>if used                                                  |              |
| 100M                                                                                 | 23'8"                                                                                                | 8'                                                               |                                                      | 1 3600                                                 | 10,000                             | 11,666                                                                                       | 8,500.                                                                  |                          |                                                                                                                                                           |                                                                                                                              | H H                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                       | $\vdash$     |
| 1 50M                                                                                | 29'2"                                                                                                | 9'8"                                                             |                                                      | 17666                                                  | 15,000                             | 17,500                                                                                       | 9,750.                                                                  |                          |                                                                                                                                                           |                                                                                                                              | •                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | •                                                                     | 1            |
| 250M                                                                                 | 38'4"                                                                                                | 11.11.                                                           |                                                      | 20500                                                  | 25,000                             | 29,180                                                                                       | 12,250.                                                                 |                          |                                                                                                                                                           |                                                                                                                              | u                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                       |              |
| 2. 36<br>COSTS<br>1. Lis<br>on<br>2. Cor                                             | ting is<br>give 12<br>models<br>t price<br>y.<br>minutor                                             | based o<br>2.5 to 1<br>availab<br>includ                         | n 100 (<br>5 1b. E<br>1e, cor                        | PCD @ C<br>SOD/100C<br>Isult fa<br>Wers and            | ctory abo                          | ut other<br>; estimat                                                                        | ing prices                                                              | y<br>OP                  | two par<br>2. Plumber<br>3. Can be<br>ERATION<br>1. Daily i<br>transfe<br>2. Operati                                                                      | ation invo<br>ts for lar<br>/electrici<br>installed<br>& MAINTE<br>nspection<br>r lines ar<br>onal skill                     | REMENTS<br>lves excavati<br>ge plants, co<br>an skills req<br>and started u<br>NANCE REQU<br>necessary to<br>e free, efflu<br>s necessary, | prosion pro<br>plired for i<br>p in one da<br><b>UREMENTS</b><br>insure blow<br>ent qualiti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | tection paint<br>nstallation.<br>y.<br>ers are opera<br>es are satisf | tin <u>c</u> |
| 1. Si;<br>to<br>2. 36<br>COSTS<br>1. Lig<br>on<br>2. Cor<br>ext                      | ting is<br>give 12<br>models<br>t price<br>y.<br>minutor<br>ras.                                     | based o<br>2.5 to 1<br>availab<br>e includ<br>es, chlo           | n 100 (<br>5 1b. E<br>1e, cor<br>les blow<br>minator | PCD @ C<br>80D/1000<br>sult fa<br>wers and<br>s, stan  | ctory abo<br>controls<br>d-by blow | ut other<br>; estimat<br>ers are c                                                           | models.<br>ing prices<br>ptional                                        | y<br>OP                  | 1. Install<br>two par<br>2. Plumber<br>3. Can be<br>PERATION<br>1. Daily i<br>transfe                                                                     | ation invo<br>ts for lar<br>/electrici<br>installed<br>& MAINTE<br>nspection<br>r lines ar<br>onal skill<br>cess.            | lves excavati<br>ge plants, co<br>an skills req<br>and started u<br>NANCE REQU<br>necessary to<br>e free, efflu                            | prosion pro<br>plired for i<br>p in one da<br><b>UREMENTS</b><br>insure blow<br>ent qualiti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | tection paint<br>nstallation.<br>y.<br>ers are opera<br>es are satisf | ting<br>tir  |
| 1. 51;<br>to<br>2. 36<br>COSTS<br>1. Lig<br>on<br>2. Cor<br>ext                      | ring is<br>give 12<br>models<br>t price<br>y.<br>minutor<br>ras.<br>TECH<br>IR = N                   | based of<br>2.5 to 1<br>availab<br>includ<br>s, chlo<br>NICAL PE | n 100 (<br>5 1b. E<br>1e, cor<br>les blow<br>minator | PCD @ C<br>SOD/100C<br>sult fa<br>Hers and<br>rs, star | ctory abo<br>controls<br>d-by blow | ut other<br>; estimat<br>ers are c<br>OPERATH<br>RANGES<br>(TEMP, OTH                        | models.<br>ing prices<br>ptional<br>NG NO<br>BERN OO                    | y<br>OP<br>SE            | 1. Install<br>two par<br>2. Plumber<br>3. Can be<br>FERATION<br>1. Daily i<br>transfe<br>2. Operati<br>and pro                                            | ation invo<br>ts for lar<br>/electrici<br>installed<br><b>&amp; MAINTE</b><br>nspection<br>r lines ar<br>onal skill<br>cess. | lves excavati<br>ge plants, co<br>an skills req<br>and started u<br>NANCE REQU<br>necessary to<br>e free, efflu                            | prosion pro<br>plired for i<br>p in one da<br><b>UREMENTS</b><br>insure blow<br>ent qualiti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | tection paint<br>nstallation.<br>y.<br>ers are opera<br>es are satisf | ting<br>ting |
| 1. Sf;<br>to<br>2. 36<br>COSTS<br>1. Lis<br>on<br>2. Cor<br>ext                      | ring is<br>give 12<br>models<br>t price<br>y.<br>minutor<br>ras.<br>TECH<br>IR-M                     | based of<br>2.5 to 1<br>availab<br>includ<br>s, chlo<br>NICAL PE | n 100 (<br>5 lb. E<br>le, cor<br>les blow<br>minator | PCD @ C<br>SOD/100C<br>sult fa<br>Hers and<br>rs, star | ctory abo<br>controls<br>d-by blow | ut other<br>; estimat<br>ers are o<br>OPERATII<br>RANGES                                     | models.<br>ing prices<br>ptional<br>NG NO<br>HERI OO                    | y<br>OP<br>SE            | 1. Install<br>two par<br>2. Plumber<br>3. Can be<br><b>ERATION</b><br>1. Daily i<br>transfe<br>2. Operati<br>and pro                                      | ation invo<br>ts for lar<br>/electricf<br>installed<br>& MAINTE<br>spection<br>r lines ar<br>onal skill<br>cess.             | lves excavati<br>ge plants, co<br>an skills req<br>and started u<br>NANCE REQU<br>necessary to<br>e free, efflu                            | prosion pro<br>plired for i<br>p in one da<br><b>UREMENTS</b><br>insure blow<br>ent qualiti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | tection paint<br>nstallation.<br>y.<br>ers are opera<br>es are satisf | ting<br>ting |
| 1. S1:<br>to<br>2. 36<br>COSTS<br>1. Li:<br>on<br>2. Cor<br>ext<br>NUMBER<br>(MAJOR) | ring is<br>give 12<br>models<br>st price<br>y.<br>minutor<br>ras.<br>TECH<br>TRCH<br>(A)<br>8<br>85- | based of<br>2.5 to 1<br>availab<br>includ<br>s, chlo<br>NICAL PE | n 100 (<br>5 lb. E<br>le, cor<br>les blow<br>minator | PCD @ C<br>SOD/100C<br>sult fa<br>Hers and<br>rs, star | ctory abo                          | ut other<br>; estimat<br>ers are c<br>OPERATI<br>RANGES<br>(TEMP, OTH<br>Normal,<br>temperat | models.<br>ing prices<br>ptional<br>wg wo<br>el noiss<br>noiss<br>No or | y<br>OP<br>se<br>0075. d | 1. Install<br>two par<br>2. Plumber<br>3. Can be<br><b>FERATION</b><br>1. Daily i<br>transfe<br>2. Operation<br>standard<br>codes met<br>Stand<br>and pro | ation invo<br>ts for lar<br>Velectrici<br><b>a MAINTE</b><br><b>a MAINTE</b><br><b>a MAINTE</b><br><b>b</b><br>th            | lves excavati<br>ge plants, co<br>an skills req<br>and started u<br>NANCE REQU<br>necessary to<br>e free, efflu                            | nrosion pro<br>uired for i<br>pp in one da<br>JIREMENTS<br>insure bloa<br>insure | tection paint<br>nstallation.<br>y.<br>ers are opera<br>es are satisf | ting<br>tir  |



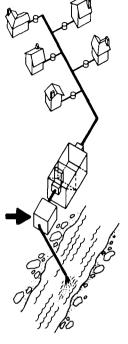


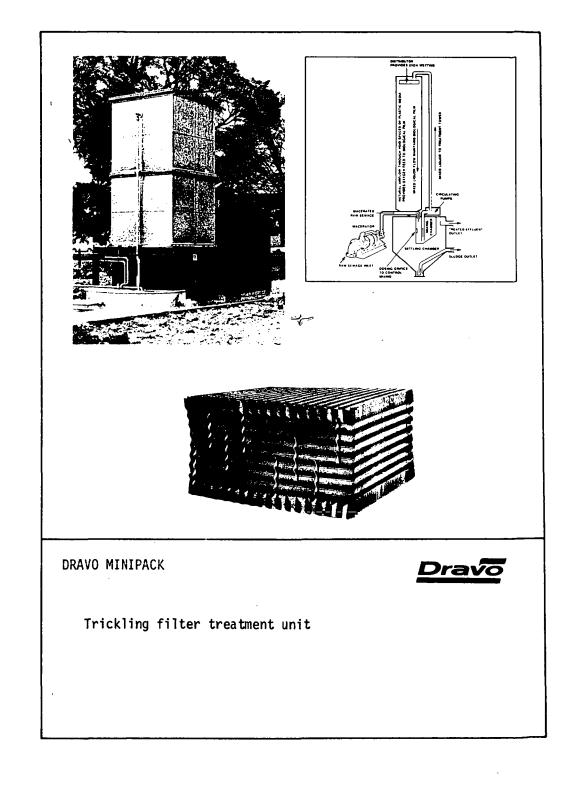
|                                             | ements.         | aeratio  | ontact 2            | one, ar  | nd round a                 | ation zon<br>larifier<br>und activa        | with            | sludge                      | <ol> <li>Influe<br/>and ae</li> <li>Mixtur<br/>natant</li> <li>Settle<br/>aerati</li> </ol> | nt sewage f<br>rated with<br>e flows int<br>flows into<br>d sludge is<br>on in reaer | l comminutor.<br>lows into "cc<br>activated slu<br>o "clarifier"<br>chlorine con<br>scraped to c<br>ation zone.<br>s to "digeste | ntact zone"<br>dge from "re<br>for settlin<br>tact zone fo<br>entered sluo | eaeration zor<br>ng of solids,<br>or discharge<br>dge return fo | ne."<br>Supe |
|---------------------------------------------|-----------------|----------|---------------------|----------|----------------------------|--------------------------------------------|-----------------|-----------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------|--------------|
|                                             |                 | DIMENSIC | MAE                 | <u> </u> |                            |                                            | 1               | CONTE (DI                   |                                                                                             | Υ                                                                                    |                                                                                                                                  |                                                                            | Γ                                                               | <u> </u>     |
| MODEL<br>NUMBER<br>(MAJOR)                  | LENGTH          | T        | 1                   | WEIGHT   | RATED<br>CAPACITY<br>(GPD) | TANK<br>CAPACITY<br>(GAL.)                 | SUGO.<br>IFO    | LIST INST                   |                                                                                             | DESIGN<br>LIFETIME<br>(YRS.)                                                         | ELECTRICITY<br>(RATING)                                                                                                          |                                                                            | OPERATING<br>SUPPLIES                                           | BLOW<br>HP   |
| 300                                         | 37 ' 4"         | 11'3"    | 10'                 |          | 30,000                     | 27,288                                     | See<br>Cost:    | s Var                       |                                                                                             | 20                                                                                   | 115/230 V<br>AC - blower                                                                                                         |                                                                            | Chlorine,<br>if used                                            | 3            |
| 350                                         | 42 ' 4"         | "        | "                   |          | 35,000                     | 31,465                                     | Belon<br>"      | "                           |                                                                                             | "                                                                                    | "                                                                                                                                |                                                                            |                                                                 |              |
| 400                                         | 45'4"           | "        | -                   |          | 40,000                     | 35,841                                     | •               |                             |                                                                                             |                                                                                      |                                                                                                                                  |                                                                            | u                                                               | "            |
| 500                                         | 53'4"           | "        | ·                   | ]        | 50,000                     | 43,138                                     |                 | .                           |                                                                                             |                                                                                      |                                                                                                                                  |                                                                            | ļ                                                               | .            |
| 2. Aer<br>chi<br>MODEt<br>NUMBER<br>(MAJOR) | orinati<br>TECH | ion equ  | ERFORMANTION, A - A | re opti  | onalextr<br>ut             | OPERATII<br>RANGES<br>(TEMP, OTH           | NG<br>B         | NOISE                       | and pro                                                                                     | *                                                                                    |                                                                                                                                  |                                                                            |                                                                 |              |
| A11                                         | 85-<br>90       |          |                     |          |                            | Normal,<br>temperat                        | .e <sup>2</sup> | Minor<br>noise.<br>No odors | NSF and<br>state hea<br>agencies                                                            | lth                                                                                  |                                                                                                                                  |                                                                            |                                                                 | -            |
|                                             | ear fro         | m date   |                     | ptance   | VICE<br>or 18 mon          | <sup>2</sup> In frigi<br>ths from Repaired | date d          | of ship-                    | TECHNICAL                                                                                   | PERFORM                                                                              | tions necessa<br>ANCE<br>agencies have                                                                                           |                                                                            | antex units.                                                    |              |

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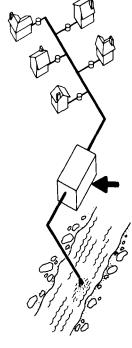
|                                                                                              | Attn                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | : Mr. i                                                                  | Ralph F                                                        | . Conte, V                                              | /ice-Presid                                                      | ent, Proces                         | is Equipme                                         | nt Divisio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | on<br>                                                   |                                                                                  |                                                                           | BACKWASH                                          | YPE FILTER-<br>SYSTEM                                           |
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Au                                                        | avity t<br>fluent<br>ove gra<br>2-3 to<br>nt deep<br>comatic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | of an a<br>de or 1<br>7F2-12<br>bed mo<br>opera                          | activat<br>below g<br>models<br>edia fi<br>tion, c             | ed sludge<br>rade app<br>, one ass<br>lter and          | e treatmen<br>lication.<br>sembly shi<br>holding f<br>ur GPM/sq. | it plant.<br>pments; d<br>ank for b | l solids f<br>lual compa<br>ackwash.<br>'ilter sur | rom i<br>rt-<br>Face.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | solids<br>2. Filteri<br>backwas<br>3. Backwas<br>water w | t is filte<br>build-up r<br>ng is swit<br>hed to ove<br>h includes<br>ash for cl | equires backs<br>ched to other<br>rflow trough<br>air wash, to<br>eaning. | wash.<br>r filter, sa<br>o loosen sol             | ilters until<br>turated filte<br>ids, followed<br>effluent flow |
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| MODEL<br>NUMBER<br>(MAJOR)                                                                   | LENGTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | WIDTI                                                                    | 4 HEIG                                                         | WEIGHT                                                  | CAPACITY<br>(GPD)                                                |                                     | SUGG. 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                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ERATION<br>STANDARD                                      | & MAINTE                                                                         |                                                                           | JIREMENTS                                         |                                                                 |
| MODEL<br>NUMBER<br>(MAJOR)                                                                   | TECI-<br>(R *<br>8006                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | INICAL P<br>% REDUC<br>\$5                                               | ERFORM<br>TION, A<br>DO                                        |                                                         |                                                                  | RANGE                               | .                                                  | OP<br>Diss<br>books                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ERATION<br>STANDARD<br>CODES MET                         | & MAINTE                                                                         |                                                                           | JIREMENTS                                         |                                                                 |
| MODEL<br>NUMBER<br>(MAJOR)<br>WARRAL<br>1.1;<br>met<br>fr.<br>2. Re<br>set<br>s. Ca<br>3. Ca | TECL<br>(R =<br>BOOg<br>NTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>VTIES,<br>V | SUARA<br>SS<br>SUARA<br>GUARA<br>om datu<br>anty on<br>harge.<br>nvoices | NTEESONN<br>NTION A<br>DO<br>NTEES<br>e of act s<br>and at \$1 | ANCE-OUTP<br>- ACTUAL V<br>COD<br>- ACTUAL V<br>COD<br> | VICE<br>or 18 moi<br>mmanship.<br>available<br>labor).           | RANGE:<br>(TEMP, OT)                | date of s                                          | OP<br>DOSE<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOORS<br>DOOR | ERATION<br>STANDARD<br>CODES MET                         | & MAINTE                                                                         | ANCE<br>ANCE<br>ts: A - Uni<br>ycle (hrs.);                               | t Flow Rate<br>C - Avg. TS<br>C D<br>0 5<br>8 4.5 | Applied (GPM<br>S (ppm); D =                                    |

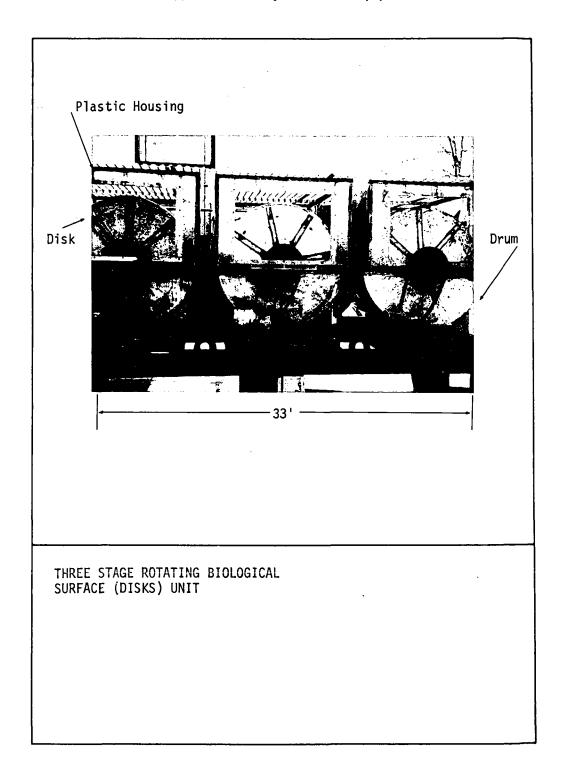




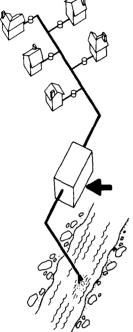
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|                                                                         | 12) 391<br>Attn                                               |                                                              | Von V                                    | reckin, l                                  | Regional S                                 | ales Mana                  | <b>P</b> er                    |                            |                                                                                                           |                                                                             |                                                                                         | NG FILTER<br>UNIT TRE              |            |
|-------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|----------------------------|--------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------|------------|
| 10<br>2. Co<br>tr<br>3. Ma<br>4. Pu<br>5. Se                            | rtical<br>gical f<br>rrugate<br>ickling<br>cerator<br>mps cir | ilm and<br>1 plasti<br>filter.<br>develop<br>culate s        | solids<br>c media<br>s mixec<br>ewage f  | separat<br>a evens<br>d liquor<br>from mix | ion.<br>distribul<br>for fili<br>ing chamt | tion and a                 | lia.                           | io-                        | 2. Mixing<br>tor in<br>3. Distrib<br>through                                                              | is macerat<br>chamber se<br>treatment<br>utor provi<br>media, in            | nds mixed lic                                                                           | ting as sew<br>flow.               | age trick  |
| -                                                                       |                                                               | MILENGLO                                                     |                                          | <u> </u>                                   |                                            | <b>—</b> —                 |                                | STS IDOLL                  |                                                                                                           | <u> </u>                                                                    |                                                                                         |                                    |            |
| MODEL<br>NUMBER<br>(MAJOR)                                              | LENGTH                                                        | 1                                                            | HEIGHT                                   | WEIGHT                                     | RATED<br>CAPACITY<br>(GPO)                 | TANK<br>CAPACITY<br>(GAL.) | SUGO, LIST                     | INSTALL                    | OPERATE                                                                                                   | DESIGN<br>LIFETIME<br>(YRS.)                                                | ELECTRICITY                                                                             |                                    |            |
| DPM2                                                                    | 5'                                                            | 3'                                                           | 11'                                      |                                            | 1,300                                      |                            | FACTORY                        | 0061                       | COST                                                                                                      |                                                                             | (RATING)<br>115 V AC                                                                    | <u> </u>                           |            |
|                                                                         | <u> </u>                                                      |                                                              | 11.                                      | $\vdash$                                   | 1,300                                      | <b> </b>                   | \$ 6,325.                      |                            |                                                                                                           |                                                                             | 115 V AC                                                                                |                                    |            |
|                                                                         |                                                               |                                                              |                                          |                                            |                                            |                            |                                |                            |                                                                                                           |                                                                             | ļ                                                                                       |                                    |            |
| <b>_</b>                                                                |                                                               |                                                              |                                          |                                            |                                            |                            |                                |                            |                                                                                                           |                                                                             |                                                                                         |                                    |            |
|                                                                         |                                                               | 9'                                                           | 11'                                      |                                            | 12,000                                     |                            | <b>\$</b> 16 <b>,</b> 330.     |                            |                                                                                                           |                                                                             |                                                                                         |                                    |            |
| SPM8                                                                    | 12'                                                           | 1                                                            |                                          |                                            |                                            | A                          | ·                              |                            | <u> </u>                                                                                                  |                                                                             | · · · · · · · · · · · · · · · · · · ·                                                   | · · · · ·                          | <u> </u>   |
| SIZING                                                                  | B GROW                                                        | VTH POT                                                      | 8 to 17                                  | 70 perso                                   | n capacit<br>is minim                      | Lies.<br>num of 4 h        | <sup>1</sup> FOB, New          | IN:<br>OP                  | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION                                      | or qualifi<br>ations, as<br>& MAINTE                                        | REMENTS<br>d; below grou<br>ed installer<br>well as star<br>NANCE REQU<br>ce a week (5- | required fo<br>rt-up.<br>UIREMENTS | or macerat |
| SiZING<br>1. Se<br>2. De                                                | B GROW                                                        | VTH POT                                                      | 8 to 17                                  | 70 perso                                   |                                            |                            |                                | IN:<br>OP                  | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION                                      | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on            | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or maceral |
| SIZING<br>1. Se<br>2. De<br>COSTS                                       | B GROW<br>ren unit<br>cention                                 | VTH POT<br>is for 1<br>time in                               | 8 to 17<br>settli                        | 70 perso                                   | is minin<br>π                              | OPERATI                    | NG H                           | IN:<br>OP<br>D18£          | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION<br>1. Solids<br>tank pr<br>STANDARD  | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on<br>ovided. | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or macera  |
| SIZING<br>1. Ser<br>2. De<br>COSTS                                      | TECH<br>(R - 5<br>(R) 5                                       | VTH POT<br>is for 1<br>time in                               | 8 to 17<br>settli                        | VCE-OUTPL                                  | is minin<br>π                              | num of 4 h                 | NG M                           |                            | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION<br>1. Solids<br>tank pr              | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on<br>ovided. | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or macera  |
| SIZING<br>1. Ser<br>2. De<br>COSTS<br>MODEL<br>NUMBER                   | TECH<br>(R - 5<br>(R) 5                                       | VTH POT<br>is for 1<br>time in                               | 8 to 17<br>settli<br>FORMAN<br>CN, A - A | VCE-OUTPL                                  | is minin<br>π                              | OPERATII                   | NG M<br>Steri) O<br>Pum<br>noi |                            | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION<br>1. Solids<br>tank pr<br>STANDARDE | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on<br>ovided. | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or macera  |
| SIZING<br>1. Se<br>2. De<br>COSTS<br>MODEL<br>NUMBER<br>(MAJOR)         | TECH<br>(R - 1<br>90-                                         | NICAL PER<br>S REPUCTI<br>SE 1<br>90-                        | 8 to 17<br>settli<br>FORMAN<br>CN, A - A | VCE-OUTPL                                  | is minin<br>π                              | OPERATII                   | NG M<br>Steri) O<br>Pum<br>noi |                            | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION<br>1. Solids<br>tank pr<br>STANDARDE | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on<br>ovided. | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or macera  |
| SIZING<br>1. Se<br>2. De<br>COSTS<br>MODEL<br>NUMBER<br>(MAJOR)         | TECH<br>(R - 1<br>90-                                         | NICAL PER<br>S REPUCTI<br>SE 1<br>90-                        | 8 to 17<br>settli<br>FORMAN<br>CN, A - A | VCE-OUTPL                                  | is minin<br>π                              | OPERATII                   | NG M<br>Steri) O<br>Pum<br>noi |                            | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION<br>1. Solids<br>tank pr<br>STANDARDE | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on<br>ovided. | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or macera  |
| SIZING<br>1. Se<br>2. De<br>COSTS<br>MODEL<br>NUMBER<br>(MAJORI<br>DPM2 | TECH<br>(R - 1<br>90-                                         | NICAL PER<br>S REPUCTI<br>SE 1<br>90-                        | 8 to 17<br>settli<br>FORMAN<br>CN, A - A | VCE-OUTPL                                  | is minin<br>π                              | OPERATII                   | NG M<br>S (ER) O<br>Pum<br>NO  |                            | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION<br>1. Solids<br>tank pr<br>STANDARDE | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on<br>ovided. | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or macera  |
| SIZING<br>1. Se<br>2. De<br>COSTS<br>MODEL<br>NUMBER<br>(MAJOR)         | Be GROW<br>ren unition<br>tention<br>Property<br>90-<br>95    | NICAL PER<br>NICAL PER<br>NECUCIT<br>SS<br>(RI)<br>90-<br>95 | 8 to 17<br>settli<br>FORMAN<br>CN, A - A | VCE-OUTPL                                  | is minin<br>π                              | OPERATII                   | NG M<br>S (ER) O<br>Pum<br>NO  | DHSE<br>OP<br>SE.<br>pdors | STALLATI<br>1. Small c<br>needed.<br>2. Dealer<br>install<br>ERATION<br>1. Solids<br>tank pr<br>STANDARDE | oncrete pa<br>or qualifi<br>ations, as<br>& MAINTE<br>removed on<br>ovided. | d; below grou<br>ed installer<br>well as star<br>NANCE REQU                             | required fo<br>rt-up.<br>UIREMENTS | or macera  |

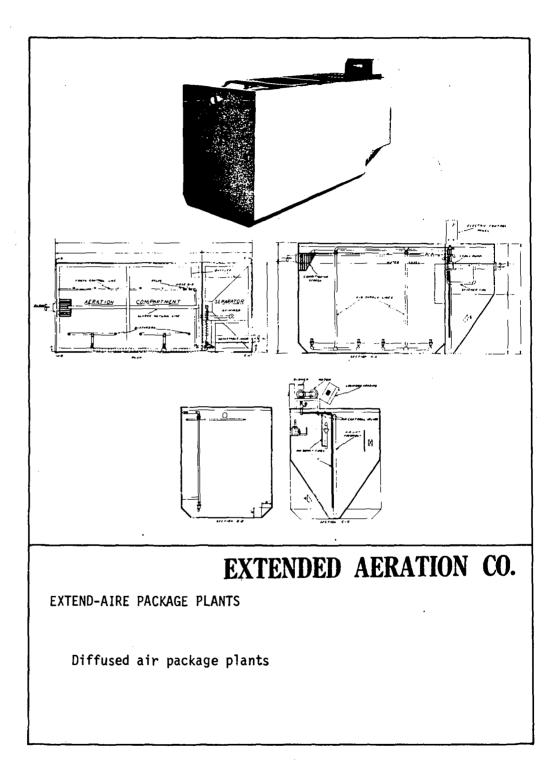




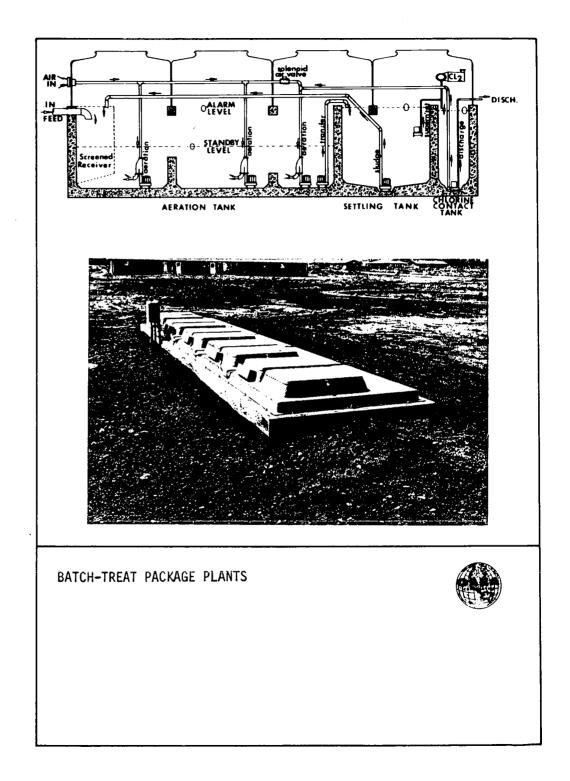
|                                                                                            | O. BOX<br>USTIN, I<br>07) 437-<br>Altn: I                                                                       | MINNE<br>5766                                                               |                                                                                               |                                                                                                            | ion Manag                       | ger                                                      |                                   |                                          |                                                                                                                                  |                                                                                    |                                                                                                                  | TING BIOLO                                                                 | GICAL SURF                                                  |
|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------|-----------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------|
|                                                                                            | ree stag                                                                                                        |                                                                             |                                                                                               |                                                                                                            |                                 |                                                          | ary, RBS,                         |                                          |                                                                                                                                  |                                                                                    |                                                                                                                  | <u> </u>                                                                   | nution, sept                                                |
| 2. Th<br>dr<br>an<br>3. Pr<br>4. Ta<br>5. S1                                               | ree sets<br>um conta<br>d sewage<br>imary tr<br>kes higi                                                        | i of 11<br>iners<br>for a<br>reatmen<br>i shock<br>raper i                  | ' diame<br>of flow<br>erobic<br>t requi<br>loads.<br>n clari                                  | ter poly<br>ing sewa<br>treatmer<br>red pric<br>fier pur                                                   | ige, carry<br>et.<br>ir to RBS. | iscs rota<br>ing slime                                   | te in hal<br>through<br>primary t | air                                      | <ol> <li>Influen<br/>in sewa<br/>and air</li> <li>Biologi<br/>filter<br/>is in m</li> <li>Effluen</li> </ol>                     | t flows thr<br>ge, carryir<br>cal growths<br>except that<br>otion).<br>t flows int | weirs to RBS<br>rough cylindi<br>ng bacteria,<br>s on discs to<br>t sewage is n<br>to clarifier<br>supernatant o | rical trough<br>are alterna<br>reat sewage<br>relatively m<br>, sludge set | tely exposed<br>(similar to<br>otionless ar<br>tles, and is |
| -                                                                                          | T .                                                                                                             | DIMENSIC                                                                    | <b>NS</b> 1                                                                                   | T                                                                                                          |                                 |                                                          | ~                                 | ETS (00LL                                |                                                                                                                                  |                                                                                    |                                                                                                                  |                                                                            | ~                                                           |
| NODEL<br>NUMBER<br>(MAJOR)                                                                 | LENGTH                                                                                                          | WIDTH                                                                       | HEIGH                                                                                         | WEIGHT                                                                                                     | RATED<br>CAPACITY<br>(GPD)      | TANK<br>CAPACITY<br>(GAL.)                               | SUGG. LIST<br>(FOB<br>FACTORY)    |                                          |                                                                                                                                  | DESIGN<br>LIFETIME<br>(YRS.)                                                       | ELECTRICITY<br>(RATING)                                                                                          |                                                                            |                                                             |
| RBS<br>10,000                                                                              | 7'4"                                                                                                            | 12'3"                                                                       | 11110                                                                                         |                                                                                                            | 10,000                          |                                                          | See<br>Costs<br>Below             | See<br>Install<br>Below                  | See<br>Costs<br>Below                                                                                                            | Discs and<br>tanks -<br>20                                                         | 115 V AC<br>or as<br>avai]able                                                                                   |                                                                            | Sodium<br>Hypo-<br>chlorite                                 |
| R95<br>25,000                                                                              | 14'3"                                                                                                           |                                                                             |                                                                                               |                                                                                                            | 25,000                          |                                                          |                                   |                                          | <u> </u>                                                                                                                         | "                                                                                  |                                                                                                                  |                                                                            |                                                             |
| RBS<br>35,000                                                                              | 18'8"                                                                                                           |                                                                             |                                                                                               | <u> </u>                                                                                                   | 35,000                          |                                                          | "                                 |                                          |                                                                                                                                  | "                                                                                  |                                                                                                                  |                                                                            | "                                                           |
| R85<br>50,000                                                                              | 25'7"                                                                                                           | "                                                                           |                                                                                               |                                                                                                            | 50,000                          |                                                          |                                   | "                                        |                                                                                                                                  | -                                                                                  |                                                                                                                  |                                                                            | "                                                           |
| 1. FO<br>GP                                                                                |                                                                                                                 |                                                                             |                                                                                               | are abo                                                                                                    | ut .005 H                       | P/disc.                                                  | Oc/day                            |                                          | pumping                                                                                                                          | out of slu                                                                         |                                                                                                                  | mar require                                                                | ments; occasi                                               |
| GPi<br>2. Di                                                                               | D capaci<br>sc power                                                                                            | requi                                                                       | rements<br>or 30,0                                                                            | DO GPD @                                                                                                   | rippm ru                        | n about 5                                                | 04/04y.                           |                                          | <ol> <li>Enclosu<br/>plastic</li> </ol>                                                                                          | tent showr                                                                         | for outdoor (<br>n); manufactu                                                                                   | operation (i<br>urer will pr                                               | .e., corruga<br>ovide.                                      |
| GPi<br>2. Di                                                                               | D capaci<br>sc power<br>lorine c                                                                                | nical Pe                                                                    | nr 30,0                                                                                       | NCE-OUTP                                                                                                   | υτ                              | OPERATI                                                  | NG N                              | DHSE                                     | 3. Enclosu<br>plastic                                                                                                            | tent showr                                                                         | or outdoor (                                                                                                     | operation (i<br>urer will pr                                               | .e., corruga<br>ovide.                                      |
| GP<br>2. Di<br>3. Ch<br>MODEL<br>NUMBER<br>(MAJOR)                                         | D capaci<br>sc power<br>lorine c<br>TECH<br>(R = %                                                              | NICAL PE<br>REDUCT                                                          | RFORMA<br>ION, A -<br>DO C                                                                    | NCE-OUTP                                                                                                   | υτ                              |                                                          | NG N<br>S<br>IER) O               | DHSE<br>A<br>DORS<br>Dr                  | plastic<br>STANDARDS<br>CODES MET                                                                                                | tent showr                                                                         | or outdoor (                                                                                                     | operation (i<br>urer will pr                                               | .e., corruga<br>ovide.                                      |
| GPI<br>2. Di<br>• 3. Ch<br>MODEL<br>NUMBER                                                 | D capaci<br>sc power<br>lorine c<br>TECH                                                                        | NICAL PE<br>REDUCT                                                          | RFORMA<br>ION, A -<br>DO C                                                                    | NCE-OUTP                                                                                                   | υτ                              | OPERATI                                                  | NG N<br>LER) O<br>Hin<br>ngi      | DHSE<br>A<br>DORS<br>Dr                  | plastic<br>STANDARD                                                                                                              | tent showr                                                                         | or outdoor (                                                                                                     | operation (i<br>urer will pr                                               | .e., corruga<br>ovide.                                      |
| GP<br>2. Di<br>3. Ch<br>MODEL<br>NUMBER<br>(MAJOR)                                         | D capaci<br>sc power<br>lorine c<br>TECH<br>(R = %                                                              | NICAL PE<br>REDUCT                                                          | PFORMA<br>TION, A -<br>DO C                                                                   | NCE-OUTP                                                                                                   | υτ                              | OPERATI                                                  | NG N<br>LER) O<br>Hin<br>ngi      | DISE<br>a<br>DORS<br>DF<br>Se,           | plastic<br>STANDARDS<br>CODES MET<br>Patented;                                                                                   | tent showr                                                                         | or outdoor (                                                                                                     | pperation (i<br>prer will pr                                               | .e., corruga<br>ovide.                                      |
| GP<br>2. Di<br>3. Ch<br>MODEL<br>NUMBER<br>(MAJOR)                                         | D capaci<br>sc power<br>lorine c<br>TECH<br>(R = %                                                              | NICAL PE<br>REDUCT                                                          | PFORMA<br>TION, A -<br>DO C                                                                   | NCE-OUTP                                                                                                   | υτ                              | OPERATI                                                  | NG N<br>LER) O<br>Hin<br>ngi      | DISE<br>a<br>DORS<br>DF<br>Se,           | plastic<br>STANDARDS<br>CODES MET<br>Patented;                                                                                   | tent showr                                                                         | or outdoor (                                                                                                     | pperation (i<br>urer will pro-                                             | .e., corruga<br>ovide.                                      |
| GP<br>2. Di<br>3. Ch<br>MODEL<br>MADRI<br>MAAORI<br>All<br>1<br>1<br>1<br>2. 2 2<br>3. Fii | D capaci<br>Sc power<br>lorine c<br>(A) 5<br>90+<br>90+<br>NTIES,G<br>year gua<br>bor).<br>year gua<br>eld serv | NICAL PE<br>REDUCT<br>SS<br>(R)<br>88<br>UARA<br>rantee<br>rantee<br>ice by | RFORMA<br>TION, A =<br>DO C<br>1.5<br>ppri<br>1.5<br>ppri<br>0.0<br>n par<br>cn dis<br>compan | ACCOUTE ACTUAL V<br>ACTUAL V<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5<br>B5 | ICE<br>orkmanshi                | openati<br>Range:<br>ITEMP, OTH<br>p (does n<br>for four | NG N<br>LER) O<br>Hin<br>ngi      | Dise<br>a<br>pors<br>se,<br>pdors.<br>Te | plastic<br>STANDARD:<br>CODES MET<br>Patented;<br>ten states<br>ECHNICAL<br>1. U. S. P.<br>2. Has bee<br>3. Dr. Bor.<br>operati: | PERFORMA<br>tent showr<br>Performation<br>perated<br>chardt, Union and perf        | or outdoor (<br>); manufactu<br>);<br>NNCE<br>3,630,366.<br>at NSF, 1972<br>versity of N                         | ichigan, ha                                                                | ov tde.                                                     |



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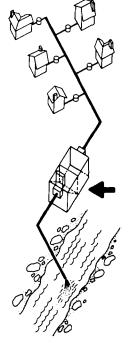
| WUNDER LENGTH WIDTH HEIGHT (LB.) 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Fro                                                                                                                                          | ES<br>fabric<br>000 GPI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| 3-3       0       4       3-3       3-00       7-90       2500,       1       1       1       ph       Chronic         H-20       12'       6'       7'9"       2000       2,500       4050, <t< th=""><th>(MAJOR)</th><th>LENGTH</th><th>WIDTH</th><th>HEIGHT</th><th>(LB.)</th><th>(GPO)</th><th>(GAL.)</th><th>(FOB ]</th><th></th><th></th><th>(YRS.)</th><th></th><th></th><th>SUPPLIE</th></t<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| SIZING & GROWTH POTENTIAL         1. Larger than 15,000 GPD, 000 GPD,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | M-150                                          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| SIZING & GROWTH POTENTIAL         1. Larger than 15,000 GPD, decands available through factory inquiry (up to 30,000 GPD).       INSTALLATION REQUIREMENTS         2. Timing of seration, flow control can accommodate larger capacities.       INSTALLATION REQUIREMENTS         2. Timing of seration, flow control can accommodate larger capacities.       COSTS         1. Tertiary treatment and extra plant equiprent available at additional price.       COSTS         2. Entire plant salvagable.       OPERATING         MODEL TECHNICAL PERFORMANCE-OUTPUT (NAMER)         (MADDN         1. Tertiary treatment and extra plant equiprent available at additional price.         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| SIZING & GROWTH POTENTIAL         1. Larger than 15,000 GPD, 000 GPD,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                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Lar<br>inq<br>2. Tim<br>cap<br><b>COSTS</b><br>1. Ter<br>add                                                                                        | ger tha<br>uiry (L<br>ing of<br>acities<br>tiary (<br>itiona)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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STALLATI<br>1. Excavat<br>day.<br>2. Concrete<br>PERATION                                                       | ON REQUI                                                               | ary, but inst<br>essary; level<br>NANCE RECU                                                                         | ling.<br>JIREMENTS               |                          |
| S-5       90       90       Ninor       1         M-20       "       -       1       1         H-150       "       -       1       1         V       -       .       .       1       1         V       -       .       .       .       1       1         V       -       .       .       .       .       1       1         V       -       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       . <td< th=""><th>1. Lar<br/>inq<br/>2. Tim<br/>cap<br/><b>COSTS</b><br/>1. Ter<br/>add<br/>2. Ent</th><th>ger tha<br/>wiry (<br/>ing of<br/>acities<br/>tiary (<br/>itional<br/>ire pla</th><th>en 15,00<br/>up to 30<br/>aeratic<br/>i.<br/>treatmer<br/>I price.<br/>unt salv</th><th>0 GPD d<br/>0,000 GP<br/>n, flow<br/>it and e<br/>agable.</th><th>emands<br/>D).<br/>Contro<br/>xtra pl</th><th>) can acc<br/>ant equip</th><th>commodate<br/>orient avai</th><th>factory<br/>larger<br/>lable at</th><th>0</th><th>STALLATI<br/>1. Excavat<br/>day.<br/>2. Concret<br/>PERATION<br/>1. Dealer</th><th>ON REQUI<br/>ion necessi<br/>e slab nece<br/>a MAINTE<br/>operation</th><th>ary, but inst<br/>essary; level<br/>NANCE RECU</th><th>ling.<br/>JIREMENTS</th><th></th></td<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1. Lar<br>inq<br>2. Tim<br>cap<br><b>COSTS</b><br>1. Ter<br>add<br>2. Ent                                                                              | ger tha<br>wiry (<br>ing of<br>acities<br>tiary (<br>itional<br>ire pla                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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                                                                                                                                                                                                                                                                                                                                              | ) can acc<br>ant equip  | commodate<br>orient avai                          | factory<br>larger<br>lable at                                                                                 | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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Excavat<br>day.<br>2. Concret<br>PERATION<br>1. Dealer                                           | ON REQUI<br>ion necessi<br>e slab nece<br>a MAINTE<br>operation        | ary, but inst<br>essary; level<br>NANCE RECU                                                                         | ling.<br>JIREMENTS               |                          |
| H-20       "       1 1/2         H-150       "       "       1 1/2         Warren in base price.       "       3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1. Lar<br>inq<br>2. Tim<br>cap<br>COSTS<br>1. Ter<br>add<br>2. Ent<br>MODEL<br>NUMMER                                                                  | ger tha<br>uiry (<br>ing of<br>acities<br>tiary (<br>itiona)<br>ire pla                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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                                                                                                                                                                                                                                                                                                                                                     | ) can acc<br>ant equip  | commodate<br>ment avai                            | factory<br>larger<br>lable at                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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STALLATI<br>1. Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDO                             | ON REQUI                                                               | ary, but inst<br>essary; level<br><b>NANCE REQU</b><br>and maintenar                                                 | ling.<br>JIREMENTS               |                          |
| 2       Source                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1. Lar<br>inq<br>2. Tim<br>cap<br><b>COSTS</b><br>1. Ter<br>add<br>2. Ent<br>NUMBER<br>(MAJOR)                                                         | ger tha<br>uiry (L<br>ing of<br>acities<br>tiary (<br>itiona)<br>ire pla<br>TECH<br>(R - 7<br>BOD 52                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                                                                                                                                                                                                        | enands<br>D).<br>contro<br>xtra pl<br>cce-outpu<br>ctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ) can acc<br>ant equip  | commodate<br>ment avai                            | factory<br>larger<br>lable at<br>KG N<br>(ER) O                                                               | Olise<br>bors                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDO                             | DN REQUI<br>ion necess<br>a Slab nec<br>a MAINTE<br>opperation<br>BLOI | ary, but inst<br>essary: level<br>NANCE REOL<br>and maintenar                                                        | ling.<br>JIREMENTS               |                          |
| WARRANTIES, GUARANTEES, & SERVICE<br>1. 1 year warranty on parts and materials.<br>2. Factory service, start-up, periodic inspections for one year<br>in base price.<br>TECHNICAL PERFORMANCE<br>TECHNICAL PERFORMANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1. Lar<br>inc<br>2. Tim<br>cap<br>COSTS<br>1. Ter<br>add<br>2. Ent<br>MODEL<br>MUMBER<br>(MAJOR)<br>S-5                                                | ger tha<br>uiry (i<br>ing of<br>acities<br>tiary (<br>itional<br>ire pla<br>TECH<br>(R - 1<br>BOD<br>8<br>90                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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                                                                                                                                                                                                                                               | enands<br>D).<br>contro<br>xtra pl<br>cce-outpu<br>ctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ) can acc<br>ant equip  | commodate<br>ment avai                            | factory<br>larger<br>lable at<br>(ER) O<br>Min<br>noi:<br>No.                                                 | Olise<br>bors                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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STALLATI<br>1. Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDO                             | ON REQUI                                                               | ary, but inst<br>essary: level<br>NANCE REON<br>and maintenar<br>NER HP                                              | ling.<br>JIREMENTS               |                          |
| WARRANTIES, GUARANTEES, & SERVICE<br>1. 1 year warranty on parts and materials.<br>2. Factory service, start-up, periodic inspections for one year<br>in base price.<br>TECHNICAL PERFORMANCE<br>TECHNICAL PERFORMANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1. Lar<br>inq<br>2. Tim<br>COSTS<br>1. Ter<br>add<br>2. Ent<br>NUMBER<br>(MAJOR)<br>S-5<br>M-20                                                        | ger tha<br>uiry (i<br>ing of a<br>cities<br>tiary f<br>itional<br>ire pla<br>VECH<br>(R - 7<br>SOD<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                                                                                                                                                                                                                                                                                                            | ) can acc<br>ant equip  | commodate<br>ment avai                            | factory<br>larger<br>lable at<br>KER) O<br>Min<br>noi:<br>                                                    | Olise<br>bors                                                                                                                                                                                                                                                                                                                                                                                                                                                                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STALLATI<br>1. Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDO                             | ON REQUI                                                               | ary, but inst<br>essary: level<br>NANCE REON<br>and maintenar<br>WER HP                                              | ling.<br>JIREMENTS               |                          |
| WARRANTIES, GUARANTEES, & SERVICE<br>1. 1 year warranty on parts and materials.<br>2. Factory service, start-up, periodic inspections for one year<br>in base price.<br>TECHNICAL PERFORMANCE<br>TECHNICAL PERFORMANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1. Lar<br>inq<br>2. Tim<br>COSTS<br>1. Ter<br>add<br>2. Ent<br>NUMBER<br>(MAJOR)<br>S-5<br>M-20                                                        | ger tha<br>uiry (i<br>ing of a<br>cities<br>tiary f<br>itional<br>ire pla<br>VECH<br>(R - 7<br>SOD<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | in 15,00<br>up to 30<br>aeratio<br>i.<br>treatmer<br>price-<br>int salv<br>INICAL PE<br>S REDUCT<br>S3 2<br>(R) 2<br>90                                                                           | O GPD d<br>1,000 GP<br>n, flow<br>it and e<br>agable.<br>RFORMAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | enands<br>D).<br>contro<br>xtra pl<br>cce-outpu<br>ctual v                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ) can acc<br>ant equip  | commodate<br>ment avai                            | factory<br>larger<br>lable at<br>KER) O<br>Min<br>noi:<br>                                                    | Olise<br>bors                                                                                                                                                                                                                                                                                                                                                                                                                                                                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STALLATI<br>1. Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDO                             | ON REQUI                                                               | ary, but inst<br>essary: level<br>NANCE REON<br>and maintenar<br>WER HP                                              | ling.<br>JIREMENTS               |                          |
| <ol> <li>Factory service, start-up, periodic inspections for one year<br/>in base price.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1. Lar<br>inq<br>2. Tim<br>COSTS<br>1. Ter<br>add<br>2. Ent<br>NUMBER<br>(MAJOR)<br>S-5<br>M-20                                                        | ger tha<br>uiry (i<br>ing of<br>acities<br>tiary (<br>itian)<br>ire pla<br>TECH<br>(R - 3<br>POPS2<br>90<br>"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | In 15,00<br>up to 30<br>aeratic<br>i.<br>treatment<br>price.<br>Int salv<br>NNCAL PE<br>S REDUCT<br>S REDUCT<br>S REDUCT<br>S REDUCT                                                              | O GPD d<br>1,000 GP<br>n, flow<br>it and e<br>agable.<br>RFORMAN                                                                                                                                                                                             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                                                                                                                                                                                                                                                                                                                                                            | ) can acc<br>ant equip  | commodate<br>ment avai                            | factory<br>larger<br>lable at<br>KG N<br>EB) O<br>Hin<br>NG '<br>'<br>'<br>'                                  | Olise<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant<br>Constant | STALLATI<br>1. Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDA<br>CODES MET                | ON REQUI                                                               | ary, but inst<br>essary: level<br>NANCE REON<br>and maintenar<br>NER HP<br>1<br>1<br>1<br>$\frac{1}{2}$<br>3         | ing.<br>JIREMENTS<br>ice.        |                          |
| COMMENTS ACCURATE AS OF July 31.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1. Lar<br>inq<br>2. Tim<br>cap<br>COSTS<br>1. Ter<br>add<br>2. Ent<br>MODEL<br>NUMBER<br>(MAJOR)<br>5-5<br>M-20<br>M-150                               | ger than<br>ing of<br>acities:<br>tiary 1:<br>tiary 1: | nn 15,002<br>aeratic<br>:<br>:<br>treatmer<br>[ price.<br>int salv<br>micAL PE<br>REDUCT<br>(R) 2<br>90<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | 00 GPD d<br>,000 GP<br>agable.<br>RFGRMAN<br>OON A * A<br>DO CO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | enands<br>D).<br>contro<br>xtra pl<br>cc.ourn<br>cruat v.<br>bo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ) can acc<br>ant equip  | commodate<br>ment avai                            | factory<br>larger<br>lable at<br>KG N<br>EB) O<br>Hin<br>NG '<br>'<br>'<br>'                                  | oise<br>books<br>Sec. 3<br>ndor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | STALLATI<br>1. Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDA<br>CODES MET<br>if properly | ON REQUI<br>ion necessi<br>a Slab nec<br>A MAINTE<br>operation<br>BLO  | ary, but inst<br>essary: level<br>NANCE REOD<br>and maintenar<br>WER HP<br>1<br>1<br>1<br>2<br>3<br>4<br>and operate | ing.<br>JIREMENTS<br>ice.        |                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1. Lar<br>inq<br>2. Tim<br>cap<br>COSTS<br>1. Ter<br>add<br>2. Ent<br>MODEL<br>MUMBER<br>(MAJOR)<br>S-5<br>M-20<br>M-150<br>WARRAJ<br>1. 1 y<br>2. Fac | ger they uiry (<br>ing of<br>acities<br>tiary i tional<br>ire pla<br>TECCC<br>(R-3)<br>90<br><br>2<br>Esti<br>NTIES, Cear war                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | nn 15,00<br>nn 15,00<br>aeratic<br>:-<br>treatmer<br>price.<br>nnt salv<br>micAL PEE<br>R REDUCT<br>90<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-  | 00 GPD d<br>,000 GP<br>n, flow<br>t and e<br>agable.<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AFORMAN<br>AF | eeands<br>D).<br>contro<br>xtra pl<br>ccourter<br>ccourter<br>ccourter<br>co<br>ccourter<br>co<br>ccourter<br>co<br>ccourter<br>co<br>ccourter<br>co<br>co<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>co<br>tro<br>tro<br>tro<br>tro<br>tro<br>tro<br>tro<br>tro<br>tro<br>tr | CE terfals.             | OPERATI<br>RANGE<br>ITEMP, OTH                    | Factory<br>larger<br>lable at<br>MG N<br>MER O<br>MIN<br>NG<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>"<br>" | OUSE<br>BOORS<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO<br>DO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | STALLATI<br>1. Excavat<br>day.<br>2. Concret:<br>PERATION<br>1. Dealer<br>STANDARDA<br>CODES MET<br>if properly | ON REQUI<br>ion necessi<br>a Slab nec<br>A MAINTE<br>operation<br>BLO  | ary, but inst<br>essary: level<br>NANCE REOD<br>and maintenar<br>WER HP<br>1<br>1<br>1<br>2<br>3<br>4<br>and operate | ing.<br>JIREMENTS<br>ice.        |                          |

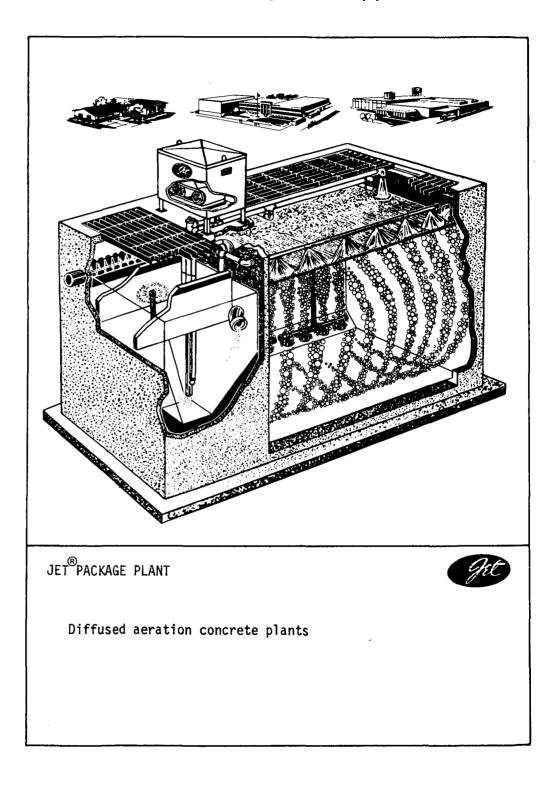


| (0                                                 | 03) 635                                                                                   | ( 346<br>IN, OR<br>1-7535                                            | EGON                                                                  | 97062                                                              | "JEE-UH"<br>, Vice-Pres                                                      | )<br>ident, Mari                                                      | Keting                               |                                                |                                                                                                                    |                                                                                                                                  |                                                                                                                                                                              | BATCH-                                                                                                                                                           |                                                                                                                                   |
|----------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| re<br>2. Ta<br>3. "B<br>co<br>4. Mi<br>pu<br>5. Fi | dular s<br>quiremo<br>nks nor<br>atch-Co<br>unt of<br>xing an<br>mps. <i>H</i><br>berglas | ents fo<br>mally<br>bunter,<br>load t<br>d aera<br>lir inj<br>s rein | r initi<br>poured<br>" furni<br>o help<br>tion by<br>ection<br>forced | al capit<br>in place<br>shed wit<br>forecast<br>single<br>by jet a | al.<br>by deale<br>h each sy<br>need for<br>phase ele<br>ction.<br>covers fo | ded, reduc<br>r.<br>stem, give<br>additiora<br>ctric subm<br>r tanks. | es absolu<br>al module               | ite a                                          | from mi<br>returne<br>2. Aeratio<br>(MLSS);<br>3. Mixed 1<br>level.<br>in aera<br>totally<br>4. One-thi<br>each 1- | xed liquor<br>d to scree<br>n tank mix<br>receives<br>iquor batc<br>Clarifier<br>tor. Aera<br>empty.<br>rd of clar<br>hr. cycle. | reservoir whi-<br>in aeration i<br>med reservoir<br>ted liquor has<br>sludge from c<br>flon flor fill<br>tion rate redu-<br>tifier #1 contr<br>Chlorination<br>pump pressure | tank; sludge<br>every 90 min<br>7000-8000 p<br>larifier #2<br>larifier #3<br>ed when there<br>used when there<br>used when the<br>sets pumped a<br>n in clarifie | ated by a<br>from clar<br>nutes.<br>pm suspend<br>every 90 :<br>after read<br>e is enoug<br>arifier #1<br>to clarifi<br>er #2. Cl |
|                                                    |                                                                                           |                                                                      |                                                                       |                                                                    |                                                                              |                                                                       | r                                    |                                                |                                                                                                                    | geo under                                                                                                                        |                                                                                                                                                                              |                                                                                                                                                                  |                                                                                                                                   |
| MODEL<br>NUMBER                                    | ┣—                                                                                        | DIMENS                                                               | T                                                                     | WEIGHT                                                             | CAPACITY                                                                     | TANK                                                                  | SUGG. LIS                            | T INSTALL                                      | TOTAL                                                                                                              | DESIGN<br>LIFETIME                                                                                                               | UTILITY REQ                                                                                                                                                                  | UIREMENTS                                                                                                                                                        |                                                                                                                                   |
| (MAJORI)<br>                                       | LENGT                                                                                     |                                                                      | H HEHOI                                                               | (T (CO.)                                                           | (GPD)                                                                        | (GAL.)                                                                | IFOB<br>FACTORY                      | CONT -                                         | COST 2                                                                                                             | (YRS.)                                                                                                                           | (RATING)                                                                                                                                                                     |                                                                                                                                                                  |                                                                                                                                   |
| 62                                                 | 16'8                                                                                      | 8'4"                                                                 | 8' 4'                                                                 |                                                                    | 5,000                                                                        | 4,600                                                                 | 5,725.                               | 1,485.                                         | 7,300.                                                                                                             |                                                                                                                                  | 115 V<br>60 Hz                                                                                                                                                               |                                                                                                                                                                  | Chlorin                                                                                                                           |
| G3                                                 | 24'8'                                                                                     |                                                                      | "                                                                     |                                                                    | 8,000                                                                        | 7,140                                                                 | 7,150.                               | 2,495.                                         | 9,750.                                                                                                             |                                                                                                                                  | n                                                                                                                                                                            |                                                                                                                                                                  |                                                                                                                                   |
| G4                                                 | 32'8                                                                                      |                                                                      |                                                                       | +                                                                  | 11,500                                                                       | 9,721                                                                 | 8,825.                               | 3,395.                                         | 12,500.                                                                                                            |                                                                                                                                  |                                                                                                                                                                              |                                                                                                                                                                  |                                                                                                                                   |
|                                                    | -                                                                                         | +                                                                    |                                                                       | +                                                                  | ļ                                                                            |                                                                       |                                      | +                                              |                                                                                                                    |                                                                                                                                  |                                                                                                                                                                              |                                                                                                                                                                  |                                                                                                                                   |
| 65                                                 | 40'8'                                                                                     | "  "                                                                 | "                                                                     |                                                                    | 15,000                                                                       | 12,364                                                                | 10,500.                              | 4,185.                                         | 15,000.                                                                                                            |                                                                                                                                  | 1 "                                                                                                                                                                          |                                                                                                                                                                  |                                                                                                                                   |
| C0                                                 | mponen                                                                                    | ts nece                                                              | ssary t                                                               | o furnis                                                           |                                                                              | ion, tank<br>ETE system                                               |                                      |                                                | electri<br>ERATION<br>1. Bi-week<br>compone                                                                        | cal work.<br><b>&amp; MAINTE</b><br>ly inspect<br>nts; refil                                                                     | NANCE REQU<br>ion; periodic<br>with chlorid                                                                                                                                  | IREMENTS<br>replacement<br>ne; maintena                                                                                                                          | of mecha                                                                                                                          |
| 1. Es<br>co<br>ex                                  | mponen:<br>tra un                                                                         | ts nece<br>less so                                                   | ssary t<br>quoted                                                     | o furnis                                                           | h a <u>COMPL</u>                                                             | <u>ETE</u> system                                                     | n. Nothi                             | ing                                            | electri<br>ERATION<br>I. Bi-week<br>compone<br>with ho<br>2. Mainten<br>aptitud                                    | cal work.<br>& MAINTE<br>ly inspect<br>nts; refil<br>se, Dipe v<br>ance requi<br>e.                                              | NANCE REQUI                                                                                                                                                                  | IREMENTS<br>replacement<br>ne; maintena<br>ewdriver.                                                                                                             | specifica<br>of mechance acco                                                                                                     |
| 1. Es<br>co                                        | mponen<br>tra un<br>tra (R =                                                              | INICAL P                                                             | SSARY t<br>QUOTED<br>ERFORM                                           | o furnis                                                           | h a <u>COMPL</u>                                                             |                                                                       | n. Nothi                             | ing                                            | electri<br>ERATION<br>1. Bi-week<br>compone<br>with ho<br>2. Mainten                                               | cal work.<br>& MAINTE<br>ly inspect<br>nts; refil<br>se, oipe w<br>ance requi<br>e.                                              | NANCE REQU<br>tion; periodic<br>with chlorin<br>wrench and scru                                                                                                              | IREMENTS<br>replacement<br>ne; maintena<br>ewdriver.                                                                                                             | specifica<br>of mechance acco                                                                                                     |
| 1. Es<br>co<br>ex<br>MODEL<br>NUMBER               | mponen<br>tra un<br>(R =<br>(R)<br>(R)                                                    | ts nece<br>less so                                                   | SSARY t<br>QUOTED<br>ERFORM                                           | o furnis                                                           | h a <u>COMPL</u>                                                             | ETE system                                                            | n. Nothi<br>Ng<br>IERI<br>Ext<br>Qui | NOISE                                          | electri<br>ERATION<br>I. Bi-week<br>compone<br>with ho<br>2. Mainten<br>aptitud<br>STANDARDS                       | cal work.<br>& MAINTE<br>ly inspect<br>nts; refil<br>se, oipe w<br>ance requi<br>e.                                              | NANCE REQU<br>tion; periodic<br>with chlorin<br>wrench and scru                                                                                                              | IREMENTS<br>replacement<br>ne; maintena<br>ewdriver.                                                                                                             | specifica<br>of mechance acco                                                                                                     |
| 1. Es<br>co<br>ex<br>MODEL<br>NUMBER<br>(MAJOR)    | mponen<br>tra un<br>(R =<br>(R)<br>(R)                                                    | INICAL P<br>N REDUC                                                  | SSARY t<br>QUOTED<br>ERFORM                                           | o furnis                                                           | h a <u>COMPL</u>                                                             | ETE system                                                            | n. Nothi<br>Ng<br>IERI<br>Ext<br>Qui | NOISE<br>B<br>ODORS<br>remeTy<br>iet.          | electri<br>ERATION<br>I. Bi-week<br>compone<br>with ho<br>2. Mainten<br>aptitud<br>STANDARDS                       | cal work.<br>& MAINTE<br>ly inspect<br>nts; refil<br>se, oipe w<br>ance requi<br>e.                                              | NANCE REQU<br>tion; periodic<br>with chlorin<br>wrench and scru                                                                                                              | IREMENTS<br>replacement<br>ne; maintena<br>ewdriver.                                                                                                             | specifica<br>of mechance acco                                                                                                     |
| 1. Es<br>co<br>ex<br>MODEL<br>NUMBER<br>(MAJOR)    | mponen<br>tra un<br>(R =<br>(R)<br>(R)                                                    | INICAL P<br>N REDUC                                                  | SSARY t<br>QUOTED<br>ERFORM                                           | o furnis                                                           | h a <u>COMPL</u>                                                             | ETE system                                                            | n. Nothi                             | NOISE<br>BOOORS<br>:reme1y<br>iet. 3<br>odors. | electri<br>ERATION<br>1. Bi-week<br>compone<br>with ho<br>2. Mainten<br>aptitud<br>STANDAROS<br>CODES MET          | cal work.<br>& MAINTE<br>ly inspect<br>nts; refil<br>se, oipe w<br>ance requi<br>e.                                              | NANCE REQU<br>tion; periodic<br>with chlorin<br>wrench and scru                                                                                                              | IREMENTS<br>replacement<br>ne; maintena<br>ewdriver.                                                                                                             | specifica<br>of mechance acco                                                                                                     |
| 1. Es<br>co<br>ex<br>MODEL<br>NUMBER<br>(MAJOR)    | mponen<br>tra un<br>(R =<br>(R)<br>(R)                                                    | INICAL P<br>N REDUC                                                  | SSARY t<br>QUOTED<br>ERFORM                                           | o furnis                                                           | h a <u>COMPL</u>                                                             | ETE system                                                            | n. Nothi                             | NOISE<br>B<br>ODORS<br>remeTy<br>iet.          | electri<br>ERATION<br>1. Bi-week<br>compone<br>with ho<br>2. Mainten<br>aptitud<br>STANDAROS<br>CODES MET          | cal work.<br>& MAINTE<br>ly inspect<br>nts; refil<br>se, oipe w<br>ance requi<br>e.                                              | NANCE REQU<br>tion; periodic<br>with chlorin<br>wrench and scru                                                                                                              | IREMENTS<br>replacement<br>ne; maintena<br>ewdriver.                                                                                                             | specific<br>of mech<br>nce acco                                                                                                   |

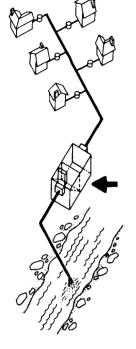
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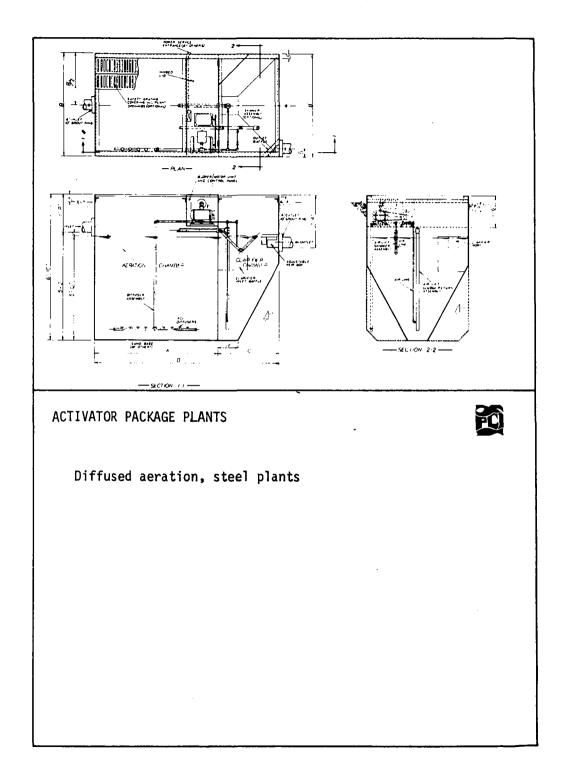
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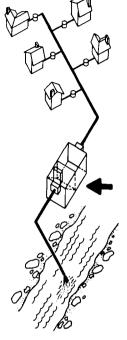


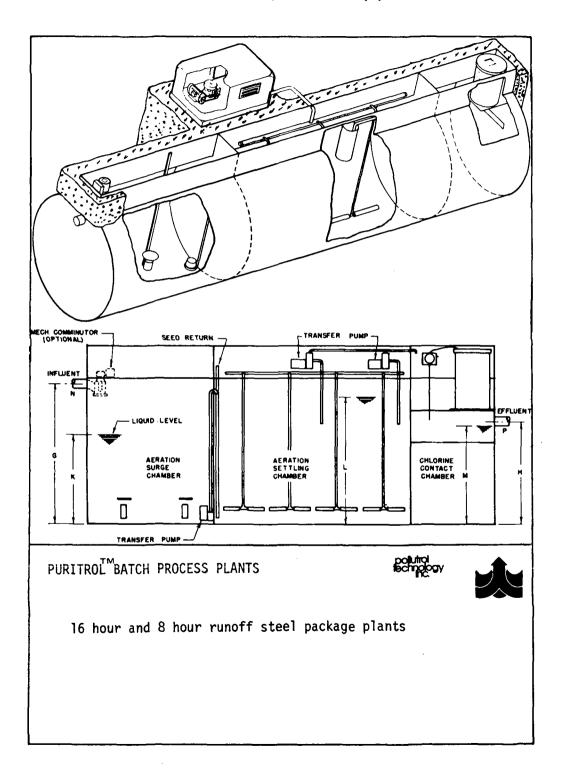
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| pla<br>2. Ain<br>3. "Ai<br>rec<br>4. Ad                                                                                                                                             | ants fro<br>r lift :<br>ir-Seal'<br>circula<br>justablo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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                                                                                                                                                                                                                                         | 000 GPD<br>; surfac<br>erate ir<br>pernatar<br>r and co                                                                                                   | capacity.<br>e skimmer<br>aeration                                                                           | tank alo<br>mel.                                                                   |                                                                           |                                                            | treatab<br>2. First,<br>in aera<br>3. Treated<br>sludge                                                                                                                                                       | le materia<br>aeration a<br>tion chamb<br>wastewate<br>returned t<br>t travels                                                             | ls.<br>nd recycled s<br>er.<br>r flows into<br>p aeration cl                                                                                           | spraying of<br>settling to<br>hamber, skin                      | etc., brings<br>influent was<br>ank, solids s<br>mmer removes<br>discharge or |
| _                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                                                                             | UTILITY RE                                                                                                                                             |                                                                 |                                                                               |
| (MAJOR)                                                                                                                                                                             | LENGTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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                                                                                                             | ELECTRICITY<br>(RATING)                                                                                                                                | l                                                               | SUPPLIES                                                                      |
| 1,500                                                                                                                                                                               | 154"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                                             | 115 V AC <sup>1</sup>                                                                                                                                  |                                                                 | Chlorine <sup>2</sup>                                                         |
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                                                                                                             | 2<br>If chlorina                                                                                                                                       | tor added.                                                      |                                                                               |
| 1. 36<br>inc<br>2. Siz<br><b>COSTS</b><br>1. Ch                                                                                                                                     | sizes (<br>creased<br>zing ba:<br>lorinat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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                                                                                                                                                                                                                                 | 1500 to<br>ules.<br>detenti<br>on, etc.                                                                                                                   | on time.                                                                                                     | D demand,                                                                          |                                                                           | 0                                                          | 2. 6" to 8<br>3. Gravel<br>PERATION<br>1. Daily s                                                                                                                                                             | cian skill<br>" concrete<br>base and 1<br>& MAINTE<br>ervice dur                                                                           | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up                                                                              | with excavi<br>ired.<br>UIREMENTS                               | ations.                                                                       |
| 1. 36<br>ind<br>2. Siz<br><b>COSTS</b><br>1. Ch <sup>*</sup><br>2. Set                                                                                                              | sizes (<br>creased<br>zing ba:<br>lorinat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                                                                                                                                                                                           | 1500 to<br>ules.<br>detenti<br>on, etc.<br>rom \$200                                                                                                      | on time.<br>, optiona<br>to \$600                                                                            |                                                                                    |                                                                           | O                                                          | <ol> <li>Electri</li> <li>6" to 8</li> <li>Gravel</li> </ol> <b>PERATION</b> <ol> <li>Daily s</li> <li>Jet per</li> </ol>                                                                                     | cian skill<br>" concrete<br>base and 1<br>& MAINTE<br>ervice dur<br>sonnel tra                                                             | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up                                                                              | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| 1. 36<br>ind<br>2. Si:<br>COSTS<br>1. Ch<br>2. Set<br>3. Ete                                                                                                                        | sizes of<br>creased<br>zing bas<br>lorinat<br>rvice co<br>cotrica                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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                                                                                                                                                                                                                     | 1500 to<br>ules.<br>detenti<br>on, etc.<br>rom \$200                                                                                                      | on time.<br>, optiona<br>) to \$600<br>ror \$14.5                                                            | l extra.<br>per year.                                                              | 00 per ma                                                                 | nth.                                                       | <ol> <li>Electri</li> <li>6" to 8</li> <li>Gravel</li> </ol> <b>PERATION</b> <ol> <li>Daily s</li> <li>Jet per</li> </ol>                                                                                     | cian skill<br>" concrete<br>base and 1<br>& MAINTE<br>ervice dur<br>sonnel tra<br>gence and u                                              | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up<br>in distribut                                                              | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| 1. 36<br>inc<br>2. Si<br>COSTS<br>1. Ch<br>2. Set<br>3. Ete                                                                                                                         | sizes of<br>creased<br>zing bas<br>lorinat<br>rvice co<br>cotrica                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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Electri<br>2. 6" to 8<br>3. Gravel<br>PERATION<br>1. Daily s<br>2. Jet per<br>intellin<br>STANDARDS                                                                                                        | cian skill<br>" concrete<br>base and 1<br>& MAINTE<br>ervice dur<br>sonnel tra<br>gence and n                                              | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up<br>in distribut                                                              | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| 1. 36<br>inc<br>2. 5iz<br>COSTS<br>1. Ch<br>2. Ser<br>3. Ele<br>MODEL                                                                                                               | sizes of<br>creased<br>zing bas<br>lorinat<br>vice cr<br>ccrica<br>TECH<br>(R-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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and 1                                              | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up<br>in distribut                                                              | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| ind<br>2. Siz<br>COSTS<br>1. Chi<br>2. Ser<br>3. Ele<br>NUMBER<br>(MAJOR)                                                                                                           | sizes of<br>creased<br>zing bas<br>lorinat<br>vice co<br>cotrica<br>(R = 1<br>(R) 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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tra<br>gence and 1                                              | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up<br>in distribut                                                              | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| 1. 36<br>inc<br>2. 5i:<br>COSTS<br>1. Ch<br>2. Ser<br>3. Ele<br>NUMBER<br>(MAJOR)<br>1,500                                                                                          | sizes of creased<br>creased<br>zing based<br>vice creation<br>creation<br>(R = 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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Electri<br>2. 6" to 8<br>3. Gravel<br>PERATION<br>1. Daily s<br>2. Jet per<br>intelli<br>STANDARD<br>CODES MET<br>Ten states<br>certify.<br>NSF certif                                                     | cian skill<br>" concrete<br>base and 1<br>& MAINTE<br>ervice dur<br>sonnel tra<br>gence and 1                                              | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up<br>in distribut                                                              | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| 1. 36<br>inc<br>2. 5i:<br>COSTS<br>1. Ch<br>2. Ser<br>3. Ele<br>NUMBER<br>(MAJOR)<br>1,500                                                                                          | sizes of creased<br>creased<br>zing based<br>vice creation<br>creation<br>(R = 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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Electri<br>2. 6" to 8<br>3. Gravel<br>PERATION<br>1. Daily s<br>2. Jet per<br>intelli<br>STANDARD<br>CODES MET<br>Ten states<br>certify.<br>NSF certif                                                     | cian skill<br>* concrete<br>base and 1<br>& MAINTE<br>ervice dur<br>sonnel tra<br>gence and i<br>ies.                                      | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up<br>in distribut                                                              | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| 1. 36<br>inc<br>2. 512<br>COSTS<br>1. Ch<br>2. See<br>3. E1e<br>NUMBER<br>(MAJOR)<br>1,500<br>2,500                                                                                 | sizes of 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| ts for<br>ing modi<br>24 hour<br>mminuti<br>s run fi<br>mptions<br>RFORMAL<br>(100, A = /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1500 to<br>ules.<br>detenti<br>on, etc.<br>rom \$200<br>range f<br>NCE-OUTP<br>NCTUAL V<br>DD                                                             | on time.<br>, optiona<br>) to \$600<br>ror \$14.5                                                            | l extra.<br>per year.<br>0 to \$53.<br>OPERATII<br>RANGES<br>(TEMP, OTM<br>0° F an | 00 per mo<br>sea<br>item d<br>d up noi<br>No                              | Of nth.                                                    | 1. Electri<br>2. 6" to 8<br>3. Gravel<br>PERATION<br>1. Daily s<br>2. Jet per<br>intelli<br>stanDarDe<br>codes met<br>Ten states<br>certify.<br>NSF certif<br>Ten states<br>certify.                          | cian skill<br>" concrete<br>base and 1<br>& MAINTE<br>ervice dur<br>sonnel tra<br>gence and i                                              | s needed for<br>pads needed<br>eveling requ<br>NANCE REQI<br>ing start-up<br>in distribut<br>mechanical at                                             | with excav<br>ired.<br>UIREMENTS                                | ations.<br>;<br>tenance; aver                                                 |
| 1. 36<br>infinition<br>2. Si3<br>2. Si3<br>1. Ch<br>2. Ser<br>3. E1<br>NUMBER<br>NUMBER<br>2. So<br>0<br>2,500<br>50,000<br>WARRAA<br>1. Si7<br>2. Lo<br>co<br>equ<br>3. Ser<br>php | sizets<br>creased<br>cring ba:<br>lorinat<br>vvice crica<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>score<br>s | of plan<br>by add<br>sed on<br>ion, co<br>ontract:<br>l consut<br>l consut<br>set<br>90+<br>90+<br>g0+<br>g0+<br>tested<br>SUARA<br>store, fi<br>icensed<br>subara                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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1500 to o<br>ules.<br>detenti<br>on, etc.<br>range f<br>wee outpr<br>actual v<br>range f<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | on time.<br>, optiona<br>to \$600<br>ror \$14.5<br>vr<br>ALUE)<br>ICE<br>ty, inclu<br>anufactur<br>base pric | l extra.<br>per year.<br>0 to \$53.<br>OPERATII<br>RANGES<br>(TEMP, OTM<br>0° F an | 00 per mo<br>tem o<br>d up not<br>No<br>se price.<br>install<br>rt-up cal | nth.<br>Noise<br>Noise<br>Se. 4<br>Odors<br>11encers<br>TI | 1. Electri<br>2. 6" to 8<br>3. Gravel<br>PERATION<br>1. Daily s<br>2. Jet per<br>intelli<br>standard<br>coots MET<br>Ten states<br>certify.<br>Ten states<br>certify.<br>for motor<br>ECHNICAL<br>1. NSF Cert | cian skill<br>concrete<br>base and 1<br>& MAINTE<br>ervice dur<br>sonnel tra<br>gence and 1<br>ies.<br>s availabl<br>PERFORM<br>tificate o | s needed for<br>pads needed<br>eveling requ<br>NANCE REQU<br>ing start-up<br>in distribut<br>mechanical at<br>e.<br>aNCE<br>/ Performancisoo GPD) mode | with excav.<br>ired.<br>UIREMENTS<br>ors in main<br>oilify requ | ations.<br>;<br>tenance; aver                                                 |

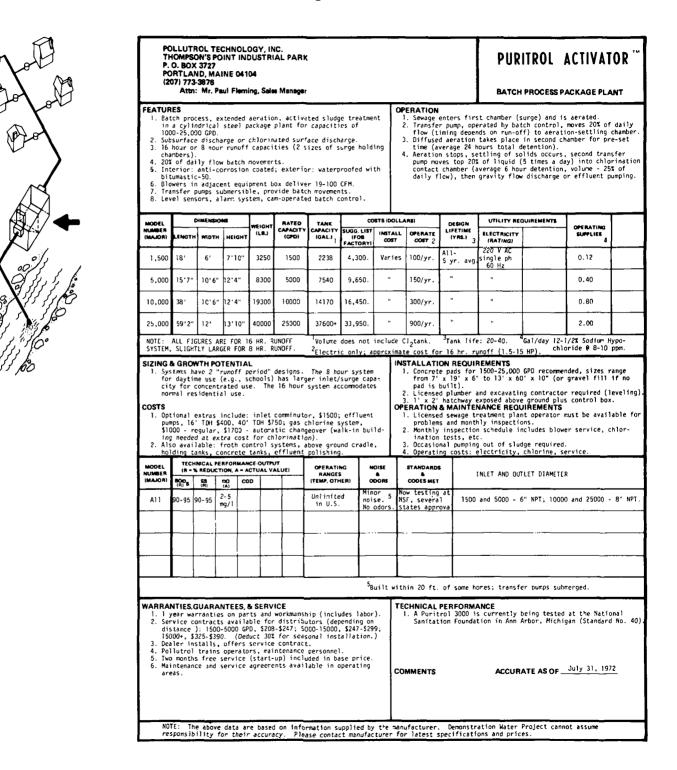


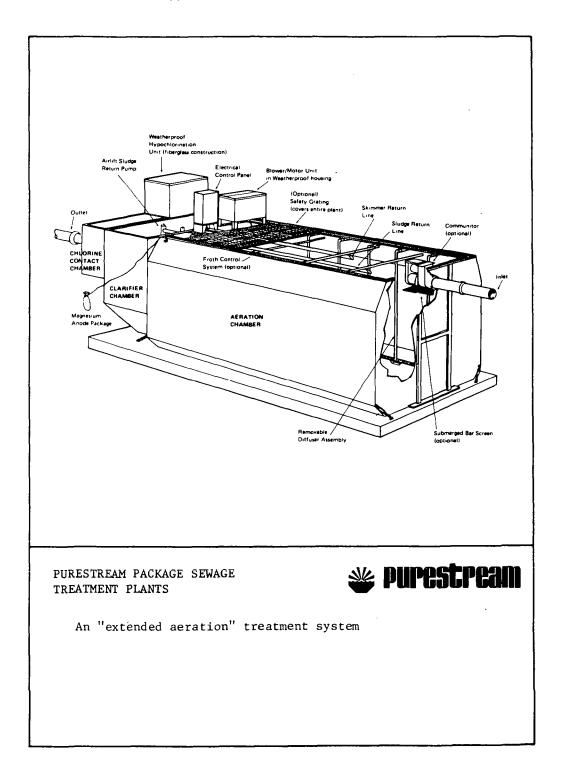


| cap<br>2. 1 t<br>3. Slu                                                               | acity.<br>o 20 HF                                                   | Roots                                                                       | blower                                                                      | used fo                                  | r aeratio                         | rom 500 t<br>n.<br>. control,             |                                        | GPD 1            | . Influen<br>chamber                                                                                                                    | enters aer<br>t is aerat<br>, solids s                                                                            | ation chamber<br>2d, froth cont<br>2ttle, sludge<br>1rough Cl <sub>2</sub> cor            | trolled, flo<br>returned to      | ows into cl<br>aeration. |  |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------|-----------------------------------|-------------------------------------------|----------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------|--------------------------|--|
| MODEL                                                                                 |                                                                     | MENNIO                                                                      | NS                                                                          | WEIGHT                                   | RATED                             | TANK                                      |                                        | STS (DOLL        | ARSI                                                                                                                                    | DEBIGN                                                                                                            | UTILITY REQ                                                                               | UIREMENTS                        |                          |  |
| NUMBER<br>(MAJOR)                                                                     | LENGTH                                                              | MDTH                                                                        | HEIGHT                                                                      | (L8.)                                    | CAPACITY<br>(GPD)                 | CAPACITY<br>(GAL.)                        | SUGG. LIST<br>(FOS<br>FACTORY)         | INSTALL<br>COST  | OPERATE<br>COST                                                                                                                         | LIFETIME<br>(YRS.)                                                                                                | ELECTRICITY<br>(RATING)                                                                   |                                  | SUPPLIES                 |  |
| S-10                                                                                  | 20'9'                                                               | 10'                                                                         | 11'                                                                         |                                          | 10,000                            | 10,000                                    | 9,096.                                 | Varies           |                                                                                                                                         | ca 20                                                                                                             | 120 V AC                                                                                  |                                  | Chlorine                 |  |
|                                                                                       |                                                                     |                                                                             |                                                                             |                                          |                                   |                                           |                                        |                  |                                                                                                                                         |                                                                                                                   |                                                                                           |                                  |                          |  |
| S-100                                                                                 | 72"                                                                 | 24.                                                                         | ч                                                                           |                                          | 100,000                           | 100,000                                   | 40,932.                                |                  |                                                                                                                                         | •                                                                                                                 | 240 V AC                                                                                  |                                  | 14                       |  |
| 1. Mod<br>or<br>2. Aer<br>COSTS<br>1. Lis<br>sec                                      | ular si<br>adding<br>ation a<br>t price<br>ond blo                  | zing al<br>adjacen<br>nd flow<br>s inclu                                    | lows fo<br>it tanks<br>contro<br>de: bas                                    | r incre<br>is help<br>ic plan            | sizing.<br>t, commin              | ation tan<br>Nutor, bar<br>Nk, chlorf     | screen.                                | ies 1<br>2<br>OP | Concrete<br>Installa<br>owner-su<br>ERATION<br>Regular<br>tion te                                                                       | ation by de<br>upplied la<br>& MAINTE<br>inspectio<br>sts, etc.                                                   | excavation.<br>ealer/professi<br>por.<br>NANCE REQU<br>n required inv                     | II <b>REMENTS</b><br>volves blow |                          |  |
| 1. Mod<br>or<br>2. Aer<br>COSTS<br>1. Lis<br>sec                                      | ular si<br>adding<br>ation a                                        | zing al<br>adjacen<br>nd flow<br>s inclu                                    | lows fo<br>it tanks<br>contro<br>de: bas                                    | r incre<br>is help<br>ic plan            | sizing.<br>t, commin              | utor, bar                                 | screen.                                | ies 2<br>OP      | Concrete<br>Installa<br>owner-su<br>ERATION<br>Regular<br>tion te<br>Qualifi                                                            | e pad and<br>ation by du<br>upplied la<br>& MAINTE<br>inspectio<br>sts, etc.<br>ed person                         | excavation.<br>ealer/profession.                                                          | IIREMENTS<br>volves blow         | er service               |  |
| 1. Mod<br>or<br>2. Aer<br>COSTS<br>1. Lis<br>sec<br>hou<br>MODEL                      | ular si<br>adding<br>ation a<br>t price<br>ond blc<br>sigg.         | zing al<br>adjacen<br>nd flow<br>s inclu<br>wer uni<br>NICAL PE<br>REDUCT   | lows fo<br>t tanks<br>contro<br>de: bas<br>t, chlo<br>RFORMAR<br>ION, A = A | r incre<br>is help<br>ic plan<br>rine co | sizing.<br>t, commin<br>ntact tan | operatii<br>Banges                        | screen,<br>nator and                   | oise             | Concrete<br>Install<br>owner-si<br>ERATION<br>Regular<br>tion te<br>Qualifie<br>Occasion                                                | e pad and a<br>ation by d<br>upplied la<br>& MAINTE<br>inspectio<br>sts, etc.<br>ed person<br>nal pumpin          | excavation.<br>ealer/profession.<br>on.<br>NANCE REQU<br>n required inv<br>required for c | IIREMENTS<br>volves blow         | er service               |  |
| or<br>2. Aer<br>COSTS<br>1. Lis<br>sec<br>hou                                         | ular si<br>adding<br>ation a<br>t price<br>ond blo<br>sigg.<br>TECH | zing al<br>adjacen<br>nd flow<br>s inclu<br>wer uni<br>NICAL PE<br>s REDUCT | lows fo<br>t tanks<br>contro<br>de: bas<br>t, chlo                          | r incre<br>is help<br>ic plan<br>rine co | sizing.<br>t, commin<br>ntact tan | utor, bar<br>ik, chlorf<br>OPERATI        | screen,<br>nator and<br>NG N<br>SERI O | OISE<br>DOISE    | . Concrete<br>2. Install<br>owner-su<br>8 Regular<br>1. Regular<br>1. Qualifie<br>2. Qualifie<br>3. Occasion                            | e pad and<br>stion by d<br>upplied la<br><b>&amp; MAINTE</b><br>inspectio<br>sts, etc.<br>ed person<br>nal pumpin | excavation.<br>ealer/profession.<br>on.<br>NANCE REQU<br>n required inv<br>required for c | IIREMENTS<br>volves blow         | er service,              |  |
| 1. Mod<br>or<br>2. Aer<br>COSTS<br>1. Lis<br>sec<br>hou<br>MODEL<br>NUMBER<br>(MAJOR) | ular st<br>adding<br>ation a<br>t price<br>ond blc<br>sigg.         | zing al<br>adjacen<br>nd flow<br>s inclu<br>wer uni<br>NICAL PE<br>s REDUCT | lows fo<br>t tanks<br>contro<br>de: bas<br>t, chlo<br>RFORMAR<br>ION, A = A | r incre<br>is help<br>ic plan<br>rine co | sizing.<br>t, commin<br>ntact tan | OPERATII<br>RANGE<br>(TEMP, OT)<br>Normal | screen,<br>nator and<br>NG N<br>SERI O | OISE<br>DOISE    | . Concrete<br>. Installe<br>owner-se<br>ERATION<br>. Regular<br>tion te<br>. Qualifi<br>. Occasion<br>STANDARDE<br>CODES MET<br>HA; one | e pad and<br>stion by d<br>upplied la<br><b>&amp; MAINTE</b><br>inspectio<br>sts, etc.<br>ed person<br>nal pumpin | excavation.<br>ealer/profession.<br>on.<br>NANCE REQU<br>n required inv<br>required for c | IIREMENTS<br>volves blow         | er service,              |  |



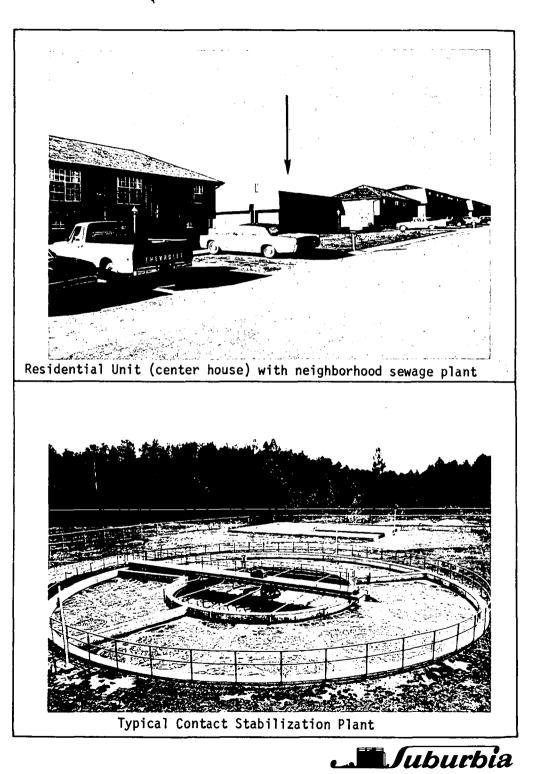






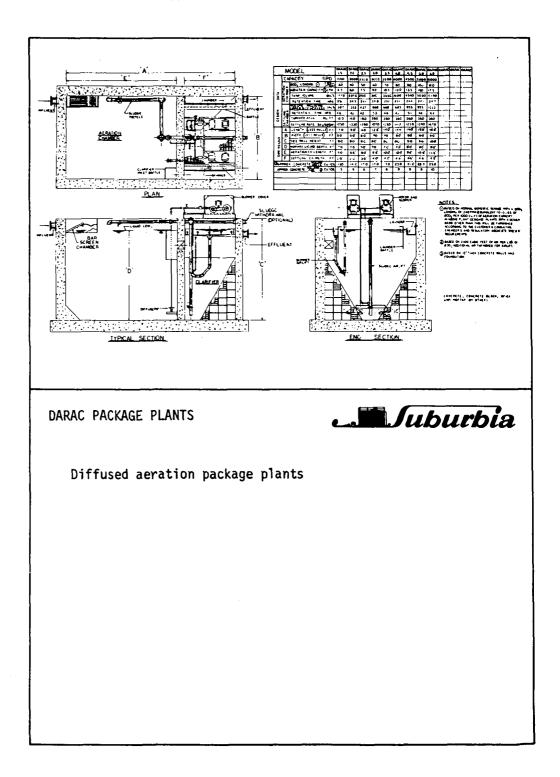
| — <u> </u>                                                                          | <b>r</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                |                                                                    | <del></del>                                     | ·                                     | <b>_</b>                   |                                                 |                                           |                                                                                                                       | ·                                                                            | · · · · · · · · · · · · · · · · · · ·                                                                     |                                      | <b></b>     |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------|---------------------------------------|----------------------------|-------------------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------|-------------|
| NODEL<br>NUMBER<br>(MAJOR)                                                          | LENGT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | WIDTH                                                                          | T                                                                  | WEIGHT                                          | RATED<br>CAPACITY<br>(GPD)            | TANK<br>CAPACITY<br>(GAL.) | SUGG, LIST                                      | INSTALL                                   |                                                                                                                       | DESIGN<br>LIFETIME<br>IVRS.)                                                 | ELECTRICITY<br>(RATING)                                                                                   |                                      |             |
| P-1-1                                                                               | 11'1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4'                                                                             | 6'                                                                 | 1800                                            | 1000                                  | 1000                       | FACTORY                                         | See<br>Install<br>Below                   | ·                                                                                                                     | 20                                                                           |                                                                                                           |                                      | Chlorine    |
| -                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                |                                                                    |                                                 |                                       |                            |                                                 | _                                         |                                                                                                                       |                                                                              |                                                                                                           |                                      |             |
| P-100-<br>15                                                                        | 72'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 24'                                                                            | +                                                                  | 87000                                           | 100,000                               | 100,000                    |                                                 | :"                                        |                                                                                                                       |                                                                              |                                                                                                           |                                      | <u> </u>    |
| 1. P1<br>GP<br>2. Mo<br>COSTS<br>1. Co                                              | int size<br>(1000<br>hts).<br>dular de<br>minuto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | es: 500-<br>GPD ind<br>esign, e                                                | -2500 Gi<br>crement:                                               | PD (500<br>s); 3,50<br>expanded<br>ol.          | GPD incre<br>00-100,000<br>3 capaciti | ements); 4<br>GPD (500     | .000-30,00<br>0 GPD inc:                        | 90<br>re- 0                               | 2. Plumbin<br>3. Crane t<br>4. Under n<br>PERATION                                                                    | ion, concr<br>g/electric<br>o off load<br>ormal cond                         | REMENTS<br>ete foundatio<br>al skills req<br>and set plan<br>itions can be<br>NANCE REQL<br>checks, no sp | utred.<br>t in place.<br>installed f | in one day. |
| 1. P1<br>GP<br>2. Mo<br>COSTS<br>1. Co                                              | nt siz() (1000<br>hts).<br>Sular di<br>minutor<br>sable,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | es: 500-<br>GPD inc<br>esign, e<br>r, froth<br>high re                         | -2500 Gi<br>crement:<br>eàsily<br>h contro<br>esale vi             | PD (500<br>s); 3,50<br>expanded<br>ol.<br>alue. | oo-loo,ooc<br>; capaciti              | ) GPD (500                 | 0 GPD inc                                       | 0<br>e-<br>Of                             | <ol> <li>Excavat</li> <li>Plumbin</li> <li>Crane t</li> <li>Under n</li> <li>PERATION</li> <li>Routine</li> </ol>     | ion, concr<br>g/electric<br>o off load<br>ormal cond<br>& MAINTE<br>periodic | ete foundatio<br>al skills req<br>and set plan<br>itions can be<br>NANCE REQL                             | utred.<br>t in place.<br>installed f | in one day. |
| 1. P1<br>GP<br>me<br>2. Ho<br>COSTS<br>1. Co<br>2. Re                               | nt siz() (1000<br>hts).<br>Sular di<br>minutor<br>sable,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | es: 500-<br>GPD inc<br>esign, e<br>r, froth<br>high re                         | -2500 Gi<br>crement:<br>eàsily i<br>h contro<br>esale vi<br>mFORMA | PD (500<br>s); 3,50<br>expanded<br>ol.<br>alue. | oo-loo,ooc<br>; capaciti              | GPD (500                   | NG GPD inc:                                     | 0<br>e-<br>Of<br>Diss<br>a<br>Sons        | 1. Excavat<br>2. Plumbin<br>3. Crane t<br>4. Under n<br>PERATION                                                      | ion, concr<br>g/electric<br>o off load<br>ormal cond<br>& MAINTE<br>periodic | ete foundatio<br>al skills req<br>and set plan<br>itions can be<br>NANCE REQL                             | utred.<br>t in place.<br>installed f | in one day. |
| GP<br>me<br>2. Mo<br>COSTS<br>1. Co<br>2. Re<br>MODEL                               | nt size<br>(1000<br>nts).<br>Jular de<br>minuto<br>Isable,<br>(R-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | es: 500-<br>GPD inc<br>esign, e<br>r, froth<br>high re                         | -2500 G<br>crement:<br>eàsily<br>h contro<br>esale vi<br>esale vi  | PD (500<br>s); 3,50<br>expanded<br>b1.<br>alue. | oo-loo,ooc<br>; capaciti              | OPERATII<br>RANGE          | NG GPD inc:<br>NG NG<br>IER) O<br>Minc<br>Ninci | OF<br>COF                                 | 1. Excavat<br>2. Plumbin<br>3. Crane t<br>4. Under n<br>PERATION<br>1. Routine                                        | ion, concr<br>g/electric<br>o off load<br>ormal cond<br>& MAINTE<br>periodic | ete foundatio<br>al skills req<br>and set plan<br>itions can be<br>NANCE REQL                             | utred.<br>t in place.<br>installed f | in one day. |
| 1. P1<br>GP<br>me<br>2. Mo<br>COSTS<br>1. Co<br>2. Re<br>MODEL<br>NUMBER<br>(MAJOR) | TECH<br>(R)<br>(1000<br>(153).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(113).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(11000).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113).<br>(1113). | es: 500-<br>GPD inc<br>esign, e<br>r, froth<br>high re<br>NNCAL PE<br>& REDUCT | -2500 G<br>crement:<br>eàsily<br>h contro<br>esale vi<br>esale vi  | PD (500<br>s); 3,50<br>expanded<br>b1.<br>alue. | oo-loo,ooc<br>; capaciti              | OPERATII<br>RANGE          | NG GPD inc:<br>NG NG<br>IER) O<br>Minc<br>Ninci | 0<br>e-<br>Of<br>Siss<br>Sons<br>rr<br>e. | 1. Excavat<br>2. Plumbin<br>3. Grane t<br>4. Under n<br>PERATION<br>1. Routine<br>STANDARD:<br>CODES MET<br>NSF Cert. | ion, concr<br>g/electric<br>o off load<br>ormal cond<br>& MAINTE<br>periodic | ete foundatio<br>al skills req<br>and set plan<br>itions can be<br>NANCE REQL                             | utred.<br>t in place.<br>installed f | in one day. |

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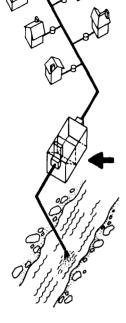


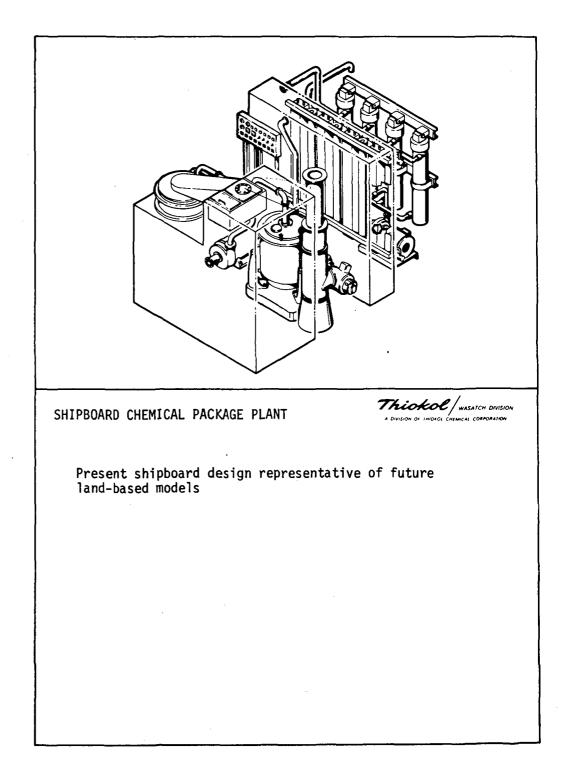
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| LE                                                        | 85 WE<br>O. BO<br>AWO<br>13) 64                                               | ST 951<br>X 6217<br>DD, KA<br>9-4994                             | NSAS 6                                        | 5206                                                               | President,                       | Sales                                |                                                  |                                    | MARAC - 100<br>mansard-roofed package play |                              |             |         |                       | ANT |
|-----------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------|----------------------------------|--------------------------------------|--------------------------------------------------|------------------------------------|--------------------------------------------|------------------------------|-------------|---------|-----------------------|-----|
| but<br>typ<br>Nor<br>2. But<br>3. Dua<br>4. ξff<br>5. Tur | 0,000<br>ilt in<br>bical o<br>th Can<br>ilt 20<br>il trea<br>fluent<br>boil m | house<br>ontact<br>olina<br>feet f<br>tment<br>chlori<br>mechani | compatal<br>stabil<br>)<br>rom neig<br>system | ble with<br>ization i<br>phoring<br>expands<br>surface o<br>itors. | surround<br>init, by :<br>houses | ings. (Se<br>Suburbia,<br>nand is gr | , Missouri<br>cond unit,<br>in Aberdee<br>eater. | ۰                                  | PERATION                                   |                              | TIAIGAN     | DHOUTED | I AVRAUE PL           |     |
|                                                           | DIMENSIONS                                                                    |                                                                  |                                               | <b>—</b>                                                           | <b></b>                          | <u> </u>                             |                                                  | TS (DOL)                           | 1 4 9 5 1                                  |                              |             |         |                       |     |
| MODEL<br>MANBER<br>(MAJOR)                                | LENGT                                                                         | T                                                                | 1                                             | WEIGHT                                                             | RATED<br>CAPACITY<br>(GPD)       | TANK<br>CAPACITY<br>(GAL.)           | SUGG. LIST<br>(FOB                               | INSTAL                             |                                            | DESIGN<br>LIFETIME<br>(YRS.) | ELECTRICITY |         | OPERATING<br>SUPPLIES |     |
| MARAC<br>100                                              | -                                                                             | -                                                                | sidence                                       | +                                                                  | 100,000                          |                                      | FACTORYI<br>See Belo                             | COST                               | CO6T                                       |                              | (RATING)    |         |                       |     |
|                                                           |                                                                               |                                                                  |                                               |                                                                    |                                  |                                      |                                                  |                                    |                                            |                              |             |         |                       |     |
| COSTS<br>1. Equ<br>clo                                    | ose to                                                                        | \$50,00                                                          | 0.                                            |                                                                    |                                  | use, land                            | and all) w                                       |                                    | PERATION                                   | & MAINTE                     | NANCE REQU  | REMENTS |                       |     |
| MODEL                                                     | (R -                                                                          | % REDU                                                           | TION, A -                                     | ACTUAL V                                                           |                                  | OPERATI<br>RANGE                     |                                                  | SE                                 | STANDARDS                                  |                              |             |         |                       |     |
| (MAJOR)<br>MARAC<br>100                                   | 91+                                                                           | 篇<br>90-95                                                       | 00                                            | ×00                                                                |                                  | (TEMP, OT)                           | Minc                                             | o <b>es</b><br>r<br>e and<br>dors. | CODES MET                                  |                              |             |         |                       |     |
|                                                           |                                                                               |                                                                  |                                               |                                                                    | _                                |                                      |                                                  |                                    |                                            |                              | ·           |         |                       |     |
|                                                           |                                                                               |                                                                  |                                               | , & SERV                                                           |                                  |                                      |                                                  |                                    | ECHNICAL                                   |                              |             |         |                       |     |

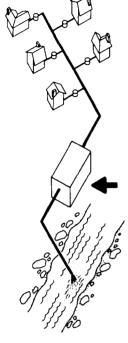


| FEATUR                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mr. L.                                                                                  | C. Sand                                                                               | y, Vice-                                                    | President,                                                                | Sales                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ERATION                                                                                              |                                                                                             |                                                                                                | ED AIR EXT                                                      |                                        |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------|
| 1. DAR<br>ret<br>2. 32<br>fro<br>3. Bar<br>uni<br>4. Mod                           | return Concrete Tank (by Others).     2. Mixed       2. 32 sized models of concrete design extended aeration plants     3. Solida       from 1500-200,000 GPD.     3. Solida       Bar screen chamber, activated sludge return, two chambered<br>unit (aeration and clarifier chambers).     4. Solida       4. Modular expansion (dual units), chlorination optional.     5. Hodag chemical foam suppression.       5. Hodag chemical foam suppression.     COSTR IDOLLARS |                                                                                         |                                                                                       |                                                             |                                                                           |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                      |                                                                                             | ation chamber<br>erated and fl<br>air-lift slu<br>ludge contact<br>immed and the<br>ischarge.  | ows into cl<br>dge return<br>                                   | arifier.<br>recycles s                 |
| WODEL WEIGHT RATED TANK                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                         |                                                                                       |                                                             |                                                                           |                                                                                                                       |                 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                                                                            |                                                                                                      |                                                                                             |                                                                                                |                                                                 | T                                      |
|                                                                                    | LENGTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WIDTH                                                                                   | HEKOHT                                                                                | WEIGHT<br>(LB.)                                             |                                                                           |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | INSTALL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | OPERATE                                                                                              | DESIGN<br>LIFETIME<br>(YRS.)                                                                | ELECTRICITY                                                                                    |                                                                 |                                        |
| DARAC                                                                              | 7'                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6'                                                                                      | 8'                                                                                    | Foot-<br>note                                               | 1,500                                                                     | 1,850                                                                                                                 | FACTORY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                                            | COST                                                                                                 | (T Hat)                                                                                     | (RATING)                                                                                       | ]<br>                                                           | Hodag                                  |
| 1.5<br>DARAC                                                                       | 16'                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 8'                                                                                      | 10'                                                                                   | #1                                                          | 6,000                                                                     | 7,400                                                                                                                 |                 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                                                                            |                                                                                                      |                                                                                             | "                                                                                              |                                                                 | anti-foa                               |
| 6.0<br>DARAC                                                                       | 25'                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10'                                                                                     | 11'                                                                                   |                                                             | 15,000                                                                    | 17,480                                                                                                                |                 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                                                                            | <u> </u>                                                                                             |                                                                                             |                                                                                                |                                                                 |                                        |
| 15.0<br>DARAC<br>50.0                                                              | 34 '                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 31'                                                                                     | 11'6"                                                                                 |                                                             | 50,000                                                                    | 58,420                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                            |                                                                                                      |                                                                                             |                                                                                                |                                                                 | n                                      |
| 50.0                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                         |                                                                                       | L                                                           |                                                                           | by other                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                            | L                                                                                                    |                                                                                             | L                                                                                              | <sup>2</sup> plus chlo                                          | L                                      |
| fac<br>wit<br>sta<br>COSTS<br>1. Cos                                               | tures r<br>h mecha<br>bilizat<br>nt acce<br>t infor                                                                                                                                                                                                                                                                                                                                                                                                                         | ectangu<br>nical o<br>ion pro<br>ssories<br>mation                                      | lar and<br>r diffu<br>cesses.<br>for pla<br>availab                                   | circul<br>sed ext<br>Also<br>ants from                      | ar, steel<br>ended aer<br>a complet<br>om 500 to<br>manufact              | and conc<br>ation, or<br>a line of<br>1,000.00<br>urer/dist                                                           | treatmen<br>O GPD.<br>ributors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                           | 2. 6" to 8<br>3. Electri<br>ERATION<br>1. For foa                                                    | " concrete<br>cian skill<br>& MAINTE<br>n suppress                                          | . of concrete<br>pads with ex<br>s, leveling r<br>NANCE REQL<br>ion, Hodag an                  | cavations,<br>equired.<br>JIREMENTS<br>ti-foam chem             | gravel bas<br>mical @ 0.               |
| fac<br>wit<br>sta<br>COSTS<br>1. Cos                                               | tures r<br>h mecha<br>bilizat<br>nt acce<br>t infor                                                                                                                                                                                                                                                                                                                                                                                                                         | ectangu<br>nical o<br>ion pro<br>ssories<br>mation                                      | lar and<br>r diffu<br>cesses.<br>for pla<br>availab                                   | circul<br>sed ext<br>Also<br>ants from                      | ar, steel<br>ended aer<br>a complet<br>om 500 to<br>manufact              | and conc<br>ation, or<br>a line of<br>1,000,00                                                                        | rete tank:<br>contact<br>treatmen<br>0 GPD.<br>ributors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 2. 6" to 8<br>3. Electri<br>ERATION<br>I. For foam<br>ppm req<br>2. Regular                          | " concrete<br>cian skill<br><b>&amp; MAINTE</b><br>n suppress<br>wired for<br>maintenan     | pads with ex<br>s, leveling r<br>NANCE REQL                                                    | cavations,<br>equired.<br>JIREMENTS<br>ti-foam chemen appropri- | gravel bas<br>mical @ O.<br>ate reduct |
| fac<br>wit<br>sta<br>pla<br>1. Cos<br>2. Com                                       | tures r<br>h mecha<br>bilizat<br>nt acce<br>t infor<br>minutio                                                                                                                                                                                                                                                                                                                                                                                                              | ectangu<br>nical o<br>ion pro<br>ssories<br>mation                                      | lar and<br>r diffu<br>cesses.<br>for pl<br>availab<br>rinatio                         | circul<br>sed ext<br>Also<br>ants fro<br>le from<br>n, etc. | ar, steel<br>ended aer<br>a complet<br>om 500 to<br>manufact<br>, optiona | and conc<br>ation, or<br>is line of<br>1,000,00<br>urer/dist<br>l extras.                                             | rete tank:<br>contact<br>treatmen<br>0 GPD.<br>ributors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                 | 2. 6" to 8<br>3. Electri<br>ERATION<br>I. For foar<br>ppm req<br>2. Regular<br>mechani               | " concrete<br>cian skill<br>& MAINTE<br>m suppress<br>wired for<br>maintenan<br>cal abilit  | pads with ex<br>s, leveling r<br>NANCE REQL<br>ion, Hodag an<br>six weeks, th<br>ce needed, av | cavations,<br>equired.<br>JIREMENTS<br>ti-foam chemen appropri- | gravel bas<br>mical @ 0.<br>ate reduct |
| fac<br>wit<br>sta<br>pla<br>COSTS<br>1. Cos<br>2. Com                              | tures r<br>h mecha<br>bilizat<br>nt acce<br>t infor<br>minutio                                                                                                                                                                                                                                                                                                                                                                                                              | ectangu<br>nical o<br>ion pro<br>ssories<br>mation<br>n, chlo<br>WCAL PEF<br>REDUCTI    | lar and<br>r diffu<br>cesses.<br>for pl<br>availab<br>rinatio                         | circul<br>sed ext<br>Also<br>ants fro<br>le from<br>n, etc. | ar, steel<br>ended aer<br>a complet<br>om 500 to<br>manufact<br>, optiona | and conc<br>ation, or<br>ie line of<br>0 1,000,00<br>uurer/dist<br>1 extras.                                          | rete tank:<br>contact<br>treatmen<br>0 GPD.<br>ributors.            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                        | 2. 6" to 8<br>3. Electri<br>ERATION<br>1. For foar<br>ppm req<br>2. Regular<br>mechani               | " concrete<br>cian skill<br>& MAINTE<br>n suppress<br>ufred for<br>maintenan<br>cal abilit, | pads with ex<br>s, leveling r<br>NANCE REQL<br>ion, Hodag an<br>six weeks, th<br>ce needed, av | cavations,<br>equired.<br>JIREMENTS<br>ti-foam chemen appropri- | gravel bas<br>mical @ 0.<br>ate reduct |
| fac<br>wit<br>sta<br>COSTS<br>1. Cos<br>2. Com<br>MODEL<br>NUMBER                  | tures r<br>h mecha<br>bilizat<br>nt acce<br>t infor<br>minutio                                                                                                                                                                                                                                                                                                                                                                                                              | ectangu<br>nical o<br>ion pro<br>ssories<br>mation<br>n, chlo<br>WCAL PEF<br>REDUCTI    | lar and<br>r diffu:<br>esses.<br>for pla<br>availab<br>rinatio<br>FORMAN<br>DN, A - A | circul<br>sed ext<br>Also<br>ants fro<br>le from<br>n, etc. | ar, steel<br>ended aer<br>a complet<br>om 500 to<br>manufact<br>, optiona | and conc<br>ration, or<br>re line of<br>1,000,00<br>urer/dist<br>l extras.                                            | vo Minima | CHRE DORS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2. 6" to 8<br>3. Electri<br>ERATION<br>1. For foar<br>ppm req<br>2. Regular<br>mechani               | " concrete<br>cian skill<br>& MAINTE<br>n suppress<br>ufred for<br>maintenan<br>cal abilit, | pads with ex<br>s, leveling r<br>NANCE REQL<br>ion, Hodag an<br>six weeks, th<br>ce needed, av | cavations,<br>equired.<br>JIREMENTS<br>ti-foam chemen appropri- | gravel bas<br>mical @ O.<br>ate reduct |
| fac<br>wit<br>sta<br>pla<br>COSTS<br>1. Cos<br>2. Com<br>MODEL<br>NUMMER<br>MAJORI | tures r<br>h mecha<br>bilizat<br>nt acce<br>t inform<br>minutio<br>TECHNI<br>(R ~ %                                                                                                                                                                                                                                                                                                                                                                                         | ectangu<br>nical o<br>ion pro<br>ssories<br>mation -<br>n, chlor<br>WCAL PEP<br>REDUCTI | lar and<br>r diffu:<br>esses.<br>for pla<br>availab<br>rinatio<br>FORMAN<br>DN, A - A | circul<br>sed ext<br>Also<br>ants fro<br>le from<br>n, etc. | ar, steel<br>ended aer<br>a complet<br>om 500 to<br>manufact<br>, optiona | and conc<br>ration, or<br>eline of<br>ol,000,00<br>urer/dist<br>l extras.<br>OPERATI<br>RANGEI<br>TENF, OTP<br>Normal | vo Minima | Corrections of the second seco | 2. 6" to 8<br>3. Electri<br>PERATION<br>1. For foai<br>ppm req<br>2. Regular<br>mechani<br>STANDARDO | " concrete<br>cian skill<br>& MAINTE<br>n suppress<br>ufred for<br>maintenan<br>cal abilit, | pads with ex<br>s, leveling r<br>NANCE REQL<br>ion, Hodag an<br>six weeks, th<br>ce needed, av | cavations,<br>equired.<br>JIREMENTS<br>ti-foam chemen appropri- | gravel bas<br>mical @ O.<br>ate reduct |
| fac<br>wit<br>sta<br>pla<br>COSTS<br>1. Cos<br>2. Com<br>MODEL<br>NUMMER<br>MAJORI | tures r<br>h mecha<br>bilizat<br>nt acce<br>t inform<br>minutio<br>TECHNI<br>(R ~ %                                                                                                                                                                                                                                                                                                                                                                                         | ectangu<br>nical o<br>ion pro<br>ssories<br>mation -<br>n, chlor<br>WCAL PEP<br>REDUCTI | lar and<br>r diffu:<br>esses.<br>for pla<br>availab<br>rinatio<br>FORMAN<br>DN, A - A | circul<br>sed ext<br>Also<br>ants fro<br>le from<br>n, etc. | ar, steel<br>ended aer<br>a complet<br>om 500 to<br>manufact<br>, optiona | and conc<br>ration, or<br>eline of<br>ol,000,00<br>urer/dist<br>l extras.<br>OPERATI<br>RANGEI<br>TENF, OTP<br>Normal | vo Minima | Corrections of the second seco | 2. 6" to 8<br>3. Electri<br>PERATION<br>1. For foai<br>ppm req<br>2. Regular<br>mechani<br>STANDARDO | " concrete<br>cian skill<br>& MAINTE<br>n suppress<br>ufred for<br>maintenan<br>cal abilit, | pads with ex<br>s, leveling r<br>NANCE REQL<br>ion, Hodag an<br>six weeks, th<br>ce needed, av | cavations,<br>equired.<br>JIREMENTS<br>ti-foam chemen appropri- | gravel bas<br>mical @ O.<br>ate reduct |





|                                                                            | O. BO)<br>(IGHA)<br>(01) 863                                                         | (524<br>M CIT)<br>3-3511<br>6 Mr. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | /, UTA<br>Paul D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | L CORF<br>AH 843<br>. Nance<br>Pollutio                                   | 02<br>, Mani                     |                            | tems                                      |                                      |                      |                                                                                                       |                                                     | TR                                        | ATMEN                    | CAL WA<br>T SYSTE | M     |
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| 2. Ce<br>3. 30<br>4. Ph<br>vi                                              | rge shi<br>ntrifuq<br>minute<br>oto-can<br>olet tr                                   | ge sepa<br>e proce<br>talyzed<br>reatmer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                     |                                                     | •                                         |                          |                   |       |
|                                                                            | <b>r</b>                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                            |                                                     |                                           |                          | ·····             | _     |
| MODEL<br>NUMBER<br>(MAJOR)                                                 | LENGTI                                                                               | WIOT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1 4                                                                       | іGHT.<br>.8.)                    | RATED<br>CAPACITY<br>(GPD) | TANK<br>CAPACITY<br>(GAL.)                | SUGG. LIST                           | INSTALL              |                                                                                                       | DESIGN<br>LIFETIME<br>(YRS.)                        | ELECTRICITY                               | QUIREMENTS               |                   |       |
| NBWTS                                                                      |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                            |                                                     | 30 Kw                                     |                          | Oil and salt      |       |
|                                                                            |                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                            |                                                     |                                           |                          |                   |       |
| 2. Sy<br>th<br>COSTS<br>1. Co                                              | UO GPU<br>stem ca<br>≥ 2000                                                          | is 200<br>in be s<br>- 100,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | perso<br>caled<br>000 GF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | on capa<br>from 5<br>PD rang<br>d range                                   | 0 to<br>e.                       |                            | ard).<br>erson capa<br>D to \$100         | acity or 1<br>,000 for               | n<br>0f              | 1. Occupie<br>ERATION<br>1. Diesel                                                                    | & MAINTE<br>or oil fue                              | c feet of sp<br>NANCE REQ                 | UIREMENTS<br>or incinera | tion, ca 15-20    | ) GPD |
| 1. 60<br>2. Sy<br>th<br>COSTS<br>1. Co<br>2,                               | JO GPU<br>stem ca<br>2000<br>sts for<br>DOD - 1                                      | is 200<br>in be s<br>- 100,<br>NBWTS<br>0,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | would<br>GPD mo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | on capa<br>from 5<br>PD rang<br>d range<br>odels.                         | 0 to<br>e.<br>from:<br>אודיטיווא | 2,000 pe<br>530,000        | erson capa<br>D to \$100                  | .000 for                             | or                   | 1. Occupie<br><b>ERATION</b><br>1. Diese1<br>2. Salt no                                               | s 250 cubi<br>& MAINTE<br>or oil fue<br>reded for o | c feet of sp<br>NANCE REQ<br>1 required f | UIREMENTS<br>or incinera | tion, ca 15-20    | 9 GPD |
| 1. 60<br>2. Sy<br>th<br>COSTS<br>1. Co                                     | JO GPU<br>stem ca<br>2000<br>sts for<br>DOD - 1                                      | is 200<br>in be s<br>- 100,<br>NBWTS<br>0,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | would<br>GPD mo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | on capa<br>from 5<br>PD rang<br>d range<br>odels.                         | 0 to<br>e.<br>from:<br>אודיט     | 2,000 pe<br>530,000        | erson capa                                | ,000 for                             | n<br>0f              | 1. Occupie<br>ERATION<br>1. Diesel                                                                    | & MAINTE<br>or oil fue<br>reded for o               | c feet of sp<br>NANCE REQ<br>1 required f | UIREMENTS<br>or incinera | tion, ca 15-20    | ) GPD |
| 1. 60<br>2. Sy<br>th<br>COSTS<br>1. Co<br>2,<br>MODEL<br>NUMBER            | DO GPD<br>stem ca<br>2 2000<br>sts for<br>000 - 1<br>7ECI<br>(R -<br>800 5           | is 200<br>n be s<br>- 100,<br>NBWTS<br>10,000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | would<br>GPD mo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | on capa<br>from 5<br>PD rang<br>d range<br>odels.<br>MANCE-CA<br>A - ACTU | 0 to<br>e.<br>from:<br>אודיט     | 2,000 pe<br>530,000        | operati<br>Bange                          | ,000 for<br>NG N<br>14ER) 0<br>150°F | n OF                 | 1. Occupie<br>ERATION<br>1. Diesel<br>2. Salt no<br>STANDARD:                                         | & MAINTE<br>or oil fue<br>eeded for o               | c feet of sp<br>NANCE REQ<br>1 required f | UIREMENTS<br>or incinera | tion, ca 15-20    | ) GPD |
| 1. 60<br>2. Sy<br>th<br>COSTS<br>1. Co<br>2,<br>MODEL<br>NUMBER<br>(MAJOR) | DO GPD<br>stem ca<br>2 2000<br>sts for<br>000 - 1<br>7ECI<br>(R -<br>800 5           | is 200<br>n be s<br>- 100,<br>NBWTS<br>0,000<br>MNICAL I<br>% REDUK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | would<br>GPD mo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | on capa<br>from 5<br>PD rang<br>d range<br>odels.<br>MANCE-CA<br>A - ACTU | 0 to<br>e.<br>from:<br>אודיט     | 2,000 pe<br>530,000        | OPERATI<br>RANGE<br>(TEMP, OT)<br>-30° to | ,000 for<br>NG N<br>14ER) 0<br>150°F | n OF                 | ERATION<br>ERATION<br>1. Diesel<br>2. Salt no<br>Standards<br>CODES MET<br>See Tech.                  | & MAINTE<br>or oil fue<br>eeded for o               | c feet of sp<br>NANCE REQ<br>1 required f | UIREMENTS<br>or incinera | tion, ca 15-20    | ) GPD |
| 1. 60<br>2. Sy<br>th<br>COSTS<br>1. Co<br>2,<br>MODEL<br>NUMBER<br>(MAJOR) | DO GPD<br>stem ca<br>2 2000<br>sts for<br>000 - 1<br>7ECI<br>(R -<br>800 5           | is 200<br>n be s<br>- 100,<br>NBWTS<br>0,000<br>MNICAL I<br>% REDUK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | would<br>GPD mo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | on capa<br>from 5<br>PD rang<br>d range<br>odels.<br>MANCE-CA<br>A - ACTU | 0 to<br>e.<br>from:<br>אודיט     | 2,000 pe<br>530,000        | OPERATI<br>RANGE<br>(TEMP, OT)<br>-30° to | ,000 for<br>NG N<br>14ER) 0<br>150°F | n OF                 | ERATION<br>ERATION<br>1. Diesel<br>2. Salt no<br>Standards<br>CODES MET<br>See Tech.                  | & MAINTE<br>or oil fue<br>eeded for o               | c feet of sp<br>NANCE REQ<br>1 required f | UIREMENTS<br>or incinera | tion, ca 15-20    | 9 GPD |
| 1. 60<br>2. Sy<br>th<br>COSTS<br>1. Co<br>2,<br>MODEL<br>NUMBER<br>(MAJOR) | JO GPU<br>tem ca<br>a 2000<br>sts for<br>100 - 1<br>7ECC<br>(R -<br>800<br>(R)<br>95 | 115 200<br>11 be s<br>11 | Person of the second se | on capa<br>from 5<br>for rang<br>d range<br>dd range<br>dd els.           | 0 to<br>re.<br>from              | 2,000 pe                   | OPERATI<br>RANGE<br>(TEMP, OT)<br>-30° to | ,000 for<br>NG N<br>14ER) 0<br>150°F | n Of<br>OrSE<br>OORS | 1. Occupie<br>ERATION<br>1. Diesel<br>2. Salt no<br>STANDARDE<br>CODES MET<br>See Tech.<br>Perf. belo | & MAINTE<br>& MAINTE<br>or oil fue<br>reded for o   | ANCE                                      | UIREMENT3                | tion, ca 15-20    |       |



#### Aeration Devices

The Domestic Standard—Compressed Oilless Air Blower, 242 Allenaire, Inc. Aerob-A-Jet-Mechanical Oxidation Unit, 244 Fairfield Engineering and Manufacturing Co. Hydrajector-Mixer, 246 Hydrajector Corporation Static Aerators-Helical Component Aeration Tubes, 248 Kenics Corporation Static Mixer-Helical Component Aeration Tubes, 250 Kenics Corporation Multi-Flo SA-Floating Aerators, 252 Multi-Flo. Inc. Helixor-Helical Component Aeration Tubes, 254 Polcon Corporation Roots AF Blowers-Two-Lobed Rotary Blowers, 256 Pollution Control, Inc. Activator-Hydro-chek Air Diffuser, 258 Pollution Control, Inc. Turboil Aerators-Floating Aerators, 260 Suburbia Systems, Inc.

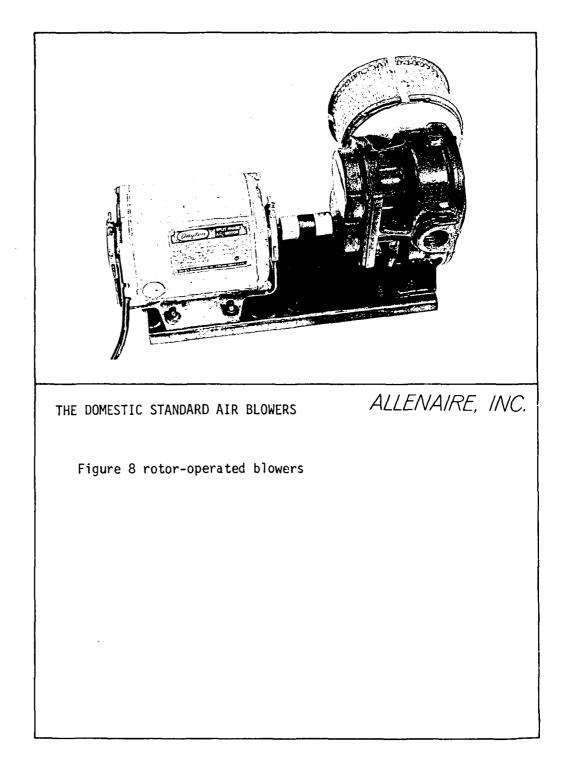
## Introduction

This section contains descriptions of a variety of aeration devices for small to large-scale application. A motor-and-blower unit is available to fabricators of individual home aerobic units for under \$200. On-site fabrication of individual home aerobic units in accordance with plans obtained from the manufacturer might be explored by projects which need many individual home units.\*

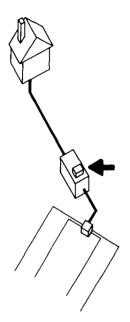
Two brands of helical flow aerators which are intended for use in oxidation ponds (lagoons) or large tanks are included. They operate as airlifts (with air injected at the bottom) which employ integral (static) turning vanes to induce flow conditions favorable to aeration. Inasmuch as the units are fixed in place and kept underwater, they are not likely to be targets of vandalism. Since all of the moving parts are contained in the shore-based air compressors which supply the mixers by hose lines, maintenance can be simplified over aeration systems which operate on or in the pond.

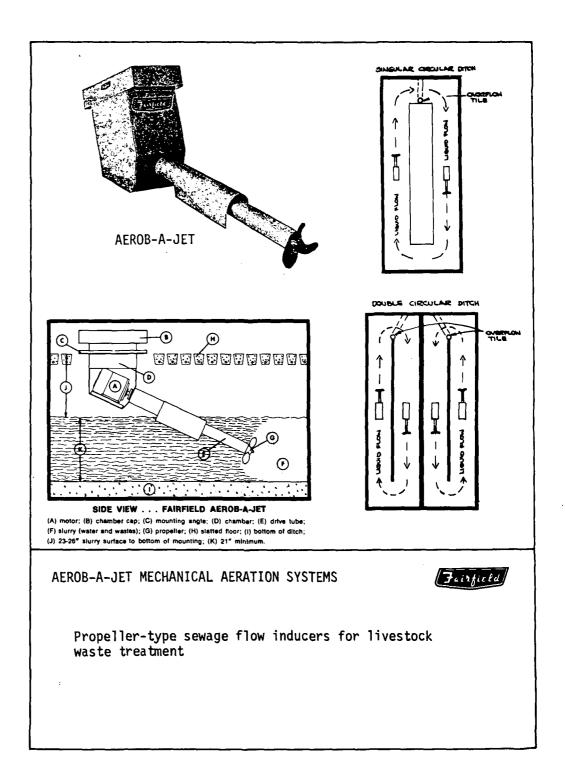
A newly-engineered floating aerator is also described. Among its virtues is the fact that no permanent installation is required other than the anchoring of mooring cables and the provision of a weatherproof and waterproof electrical line. Since the aerator and motor are submerged, the unit is also relatively immune to vandalism and surface icing, and the submerged center of gravity lends stability.

\*Just such an aerobic system, fabricated on-site with cinderblock materials and waterproofing, was observed by one of the authors on a visit to the Appalachian Environmental Health Demonstration Project, 108 South Kentucky Avenue, Corbin, Kentucky 40701. As far as a visual check could determine, the unit was working properly after over a year of service. The mixed liquor in the aeration chamber was brown, with no noticeable odor.

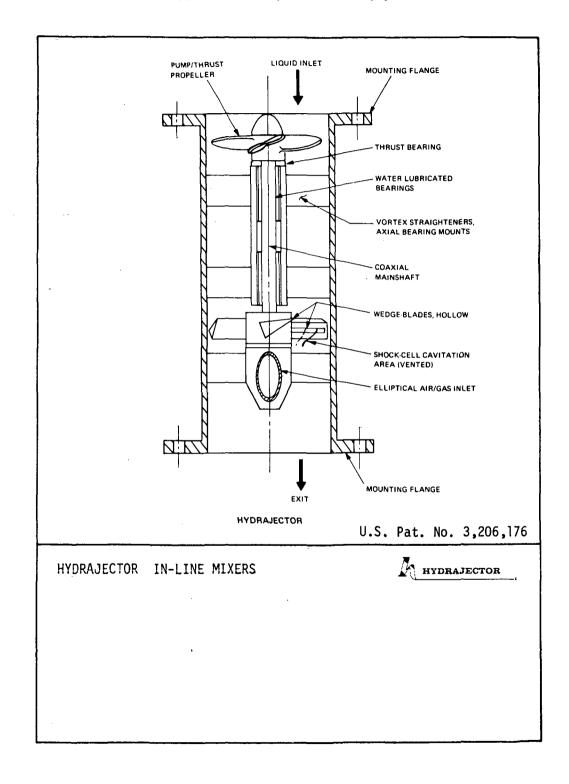


| FEATUR                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mr. R                                                                  | , D. Ali                                                                   | en, Presid                                                                                                  | lent<br>                                                                       |                                                                                           |                                                                    |                                                             | PERATION                                                                                                                                                             |                                                                                                                                          |                                                                                                                                        |                                                                                                          | LESS AIR BLO                                                                        | DWEI        |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------|
| mov<br>2. Two<br>3/4<br>3. 1"                                                                               | 3/4 HP, split phase motor; offered on NEMA 48 Frame.     3. Gears (oiled.       1º NPT.     . Units produce 10 to 30 CFM air, at 1/3 to 3/4 HP.     3. Gears (oiled.       . Units produce 10 to 30 CFM air, at 1/3 to 3/4 HP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                        |                                                                            |                                                                                                             |                                                                                |                                                                                           |                                                                    |                                                             |                                                                                                                                                                      |                                                                                                                                          |                                                                                                                                        | in opposite<br>for compres                                                                               | directions,<br>sed discharge                                                        | pu]]        |
|                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                        |                                                                            | -                                                                                                           | <u> </u>                                                                       | 1                                                                                         |                                                                    |                                                             |                                                                                                                                                                      | · · · · ·                                                                                                                                |                                                                                                                                        |                                                                                                          | T                                                                                   | _           |
| MODEL<br>NUMBER<br>(MAJOR)                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | г                                                                      | 1                                                                          |                                                                                                             |                                                                                |                                                                                           |                                                                    |                                                             |                                                                                                                                                                      | DESIGN<br>LIFETINE<br>(YRL)                                                                                                              | ELECTRICITY<br>(RATING) 2                                                                                                              |                                                                                                          |                                                                                     |             |
| 1725<br>RPM                                                                                                 | 18"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 9 <mark>1</mark> "                                                     | 8 <mark>3</mark>                                                           | "                                                                                                           | NA                                                                             | NA                                                                                        | See<br>Costs<br>below                                              |                                                             |                                                                                                                                                                      |                                                                                                                                          | 115 V AC<br>6.8 amp                                                                                                                    |                                                                                                          | Electricity<br>Air                                                                  |             |
| 3450<br>RPM                                                                                                 | 19"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | "                                                                      |                                                                            |                                                                                                             | "                                                                              |                                                                                           |                                                                    |                                                             |                                                                                                                                                                      |                                                                                                                                          | 115 V AC                                                                                                                               |                                                                                                          | "                                                                                   |             |
|                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                        |                                                                            |                                                                                                             |                                                                                | [                                                                                         |                                                                    |                                                             | 1                                                                                                                                                                    |                                                                                                                                          |                                                                                                                                        |                                                                                                          |                                                                                     | 1           |
|                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                        | <u> </u>                                                                   | 1                                                                                                           | ļ                                                                              |                                                                                           |                                                                    |                                                             |                                                                                                                                                                      |                                                                                                                                          |                                                                                                                                        |                                                                                                          | L                                                                                   |             |
| 2. B1c<br>uni<br>345<br>COSTS                                                                               | B GROW<br>ting for<br>wers ma<br>its: over<br>50 RPM to<br>be; over                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TH PO<br>motor<br>by be o<br>r 100<br>mits:<br>- 100 f                 | s from<br>perated<br>ft. awa<br>10-100<br>t. away                          | AL<br>1500 to<br>d at a di<br>ay, use 1<br>ft. away<br>y, use 2*                                            | 3600 RPM.<br>istance fr<br>1-1/4" dia<br>v, use 1-1<br>diameter                | air filte<br>rom applia<br>ameter del<br>1/2" diame<br>r delivery<br>brs @ \$186          | nce: 1725<br>ivery tub<br>ter deliv<br>tube.                       | RPM                                                         | NSTALLATI<br>1. If blow<br>vault (<br>2" wall<br>2. Not flo<br>PERATION<br>1. RPM bel<br>2. Oversiz<br>3. Oiling                                                     | ON REQUI<br>er is outs<br>e.g., 33"<br>s with air<br>od proof;<br>a MAINTE<br>ow 1500 or<br>ed air fil<br>required a                     | REMENTS<br>ide, it shoul<br>x 28" x 24" c<br>intake).<br>must be prote<br>NANCE REOL<br>above 3600 r<br>ter; replacen<br>fter two year | Id be incorp<br>concrete [63<br>ected from w<br>JIREMENTS<br>not recommen<br>nent needed<br>rs of househ | ded.<br>occasionally.<br>old use.                                                   | wer<br>ault |
| 7. 5f2<br>2. B1c<br>uni<br>345<br><b>COSTS</b><br>1. B1c                                                    | <b>B GROW</b><br>ting for<br>wers mains<br>ts: over<br>50 RPM to<br>50; over<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | WTH PC<br>- motor<br>by be o<br>er 100<br>inits:<br>- 100 f<br>i motor | s from<br>perated<br>ft. awa<br>10-100<br>t. away<br>sells                 | AL<br>1500 to<br>d at a di<br>ay, use 1<br>ft. away<br>y, use 2*<br>to tank                                 | 3600 RPM.<br>istance fr<br>1-1/4" dia<br>y, use 1-1<br>diameter<br>fabricato   | rom applia<br>ameter del<br>1/2" diame<br>r delivery<br>prs @ \$186                       | nce: 172:<br>ivery tub<br>ter deli<br>tube.                        | RPM<br>le;<br>lery<br>O                                     | NSTALLATI<br>1. If blow<br>vault (<br>2" wall<br>2. Not flo<br>PERATION<br>1. RPM bel<br>2. Oversiz<br>3. Oiling<br>4. Motor n                                       | ON REQUI<br>er is outs<br>er., 33"<br>s with air<br>od proof;<br><b>a MAINTE</b><br>ow 1500 or<br>ed air fil<br>required a<br>eeds one d | REMENTS<br>ide, it shoul<br>x 28" x 24" c<br>intake).<br>must be prote<br>NANCE REOL<br>above 3600 r<br>ter; replacen<br>fter two year | Id be incorp<br>concrete [63<br>ected from w<br>JIREMENTS<br>not recommen<br>nent needed<br>rs of househ | norated in blo<br>120 cu. in.] v<br>Heather.<br>Nded.<br>occasionally.              | wer<br>ault |
| 1. Sf2<br>2. Blc<br>uni<br>345<br><b>COSTS</b><br>1. Blc                                                    | B GROW<br>ting for<br>wers mains<br>its: over<br>50 RPM to<br>be; over<br>ower and<br>wer and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | WTH PC<br>motor<br>by be o<br>r 100<br>mits:<br>- 100 f<br>i motor     | TENTI<br>s from<br>perate<br>ft. awa<br>10-100<br>t. awa<br>sells<br>sells | AL<br>1500 to<br>d at a di<br>ay, use 1<br>ft. away<br>y, use 2*                                            | 3600 RPM.<br>istance fr<br>1-1/4" dia<br>(, use 1-1<br>" diameter<br>fabricato | rom applia<br>ameter del<br>1/2" diame<br>r delivery                                      | nce: 1725<br>ivery tub<br>ter delin<br>tube.                       | RPM                                                         | NSTALLATI<br>1. If blow<br>vault (<br>2" wall<br>2. Not flo<br>PERATION<br>1. RPM bel<br>2. Oversiz<br>3. Oiling                                                     | ON REQUI<br>er is outs<br>e.g., 33"<br>s with air<br>od proof;<br>a MAINTE<br>ow 1500 or<br>ed air fil<br>required a<br>eeds one d       | REMENTS<br>ide, it shoul<br>x 28" x 24" c<br>intake).<br>must be prote<br>NANCE REOL<br>above 3600 r<br>ter; replacen<br>fter two year | Id be incorp<br>concrete [63<br>ected from w<br>JIREMENTS<br>not recommen<br>nent needed<br>rs of househ | norated in blo<br>120 cu. in.] v<br>weather.<br>Nded.<br>occasionally.<br>nold use. | wer<br>ault |
| 1. Sf2<br>2. Blc<br>uni<br>345<br>COSTS<br>1. Blc                                                           | B GROW<br>ting for<br>wers mains<br>its: over<br>50 RPM to<br>50 RPM to                                                                      | VTH PC<br>motor<br>by be o<br>r 100<br>mits:<br>100 f<br>i motor       | TENTI<br>s from<br>perate<br>ft. awa<br>10-100<br>t. awa<br>sells<br>sells | AL<br>1500 to<br>d at a di<br>ay, use 1<br>ft. away<br>y, use 2°<br>to tank                                 | 3600 RPM.<br>istance fr<br>1-1/4" dia<br>(, use 1-1<br>" diameter<br>fabricato | rom applia<br>ameter del<br>//2" diame<br>r delivery<br>pors @ \$186<br>OPERATH<br>RANGES | nce: 1725<br>ivery tut<br>ter delin<br>tube.<br><br>NG I<br>EERI C | i RPM<br>le;<br>ery<br>O                                    | NSTALLATI<br>1. If blow<br>vault (<br>2" wall<br>2. Not flo<br>PERATION<br>1. RPM bel<br>2. Oversiz<br>3. Oiling<br>4. Motor n<br>STANDARDX                          | ON REQUI<br>er is outs<br>e.g., 33"<br>s with air<br>od proof;<br>a MAINTE<br>ow 1500 or<br>ed air fil<br>required a<br>eeds one d       | REMENTS<br>ide, it shoul<br>x 28" x 24" c<br>intake).<br>must be prote<br>NANCE REOL<br>above 3600 r<br>ter; replacen<br>fter two year | Id be incorp<br>concrete [63<br>ected from w<br>JIREMENTS<br>not recommen<br>nent needed<br>rs of househ | norated in blo<br>120 cu. in.] v<br>weather.<br>Nded.<br>occasionally.<br>nold use. | wer<br>ault |
| 1. Sf2<br>2. Blc<br>uni<br>344<br>COSTS<br>1. Blc<br>MODEL<br>NUMBER<br>MAJORI<br>1725                      | E GROW<br>fing for<br>owers mit<br>ts: over<br>50 RPM (<br>50 R | VTH PC<br>motor<br>be o<br>er 100<br>mits:<br>100 f<br>i motor         | TENTI<br>s from<br>perated<br>ft. away<br>sells<br>sells                   | AL<br>1500 to<br>d at a di<br>ay, use 1<br>ft. away<br>y, use 2°<br>to tank<br>ANCE-OUTP<br>ACTUAL V<br>COD | 3600 RPM.<br>istance fr<br>1-1/4" dia<br>(, use 1-1<br>" diameter<br>fabricato | rom applia<br>ameter del<br>//2" diame<br>r delivery<br>pors @ \$186<br>OPERATH<br>RANGES | nce: 1725<br>ivery tut<br>ter delin<br>tube.<br><br>NG I<br>EERI C | i RPM<br>le;<br>ery<br>O                                    | NSTALLATI<br>1. If blow<br>vault (<br>2" wall<br>2. Not flo<br>PERATION<br>1. RPM bel<br>2. Oversiz<br>3. Oiling<br>4. Motor n<br>STANDARDX<br>CODES MET             | ON REQUI<br>er is outs<br>e.g., 33"<br>s with air<br>od proof;<br>a MAINTE<br>ow 1500 or<br>ed air fil<br>required a<br>eeds one d       | REMENTS<br>ide, it shoul<br>x 28" x 24" c<br>intake).<br>must be prote<br>NANCE REOL<br>above 3600 r<br>ter; replacen<br>fter two year | Id be incorp<br>concrete [63<br>ected from w<br>JIREMENTS<br>not recommen<br>nent needed<br>rs of househ | norated in blo<br>120 cu. in.] v<br>weather.<br>Nded.<br>occasionally.<br>nold use. | wer<br>ault |
| 1. Sf2<br>2. Blc<br>units<br>345<br>2. Blc<br>units<br>3450<br>1. Blc<br>1. Blc<br>1. Blc<br>1. Blc<br>3450 | TECH<br>GROW<br>ting for<br>wers miles: over<br>tis:                                                                                                                                                                                                                                                                                                                      | NA                                                                     | TENTI<br>s from<br>perate<br>ft. awa<br>10-100<br>t. awa<br>sells<br>sells | AL<br>1500 to<br>d at a di<br>ay, use 1<br>ft. away<br>y, use 2'<br>to tank<br>ANCE-OUTP<br>ACTUAL V<br>COD | 3600 RPM.<br>istance fr<br>1-1/4" dia<br>(, use 1-1<br>" diameter<br>fabricato | rom applia<br>ameter del<br>//2" diame<br>r delivery<br>pors @ \$186<br>OPERATH<br>RANGES | nce: 1725<br>ivery tut<br>ter delin<br>tube.<br><br>NG I<br>EERI C | i RPM<br>le;<br>ery<br>O<br>Wise<br>books<br>data<br>noise. | NSTALLATI<br>1. If blow<br>vault (<br>2" wall<br>2. Not flo<br>PERATION<br>1. RPM bel<br>2. Oversiz<br>3. Oilling<br>4. Motor n<br>STANDARD<br>CODES MET<br>Patented | ON REQUI<br>er is outs<br>e.g., 33"<br>s with air<br>od proof;<br>a MAINTE<br>ow 1500 or<br>ed air fil<br>required a<br>eeds one d       | REMENTS<br>ide, it shoul<br>x 28" x 24" c<br>intake).<br>must be prote<br>NANCE REOL<br>above 3600 r<br>ter; replacen<br>fter two year | Id be incorp<br>concrete [63<br>ected from w<br>JIREMENTS<br>not recommen<br>nent needed<br>rs of househ | norated in blo<br>120 cu. in.] v<br>weather.<br>Nded.<br>occasionally.<br>nold use. | wer<br>ault |
| 1. Sf2<br>2. Blc<br>units<br>345<br>2. Blc<br>units<br>3450<br>1. Blc<br>1. Blc<br>1. Blc<br>1. Blc<br>3450 | TECH<br>GROW<br>ting for<br>wers miles: over<br>tis:                                                                                                                                                                                                                                                                                                                      | NA                                                                     | TENTI<br>s from<br>perate<br>ft. awa<br>10-100<br>t. awa<br>sells<br>sells | AL<br>1500 to<br>d at a di<br>ay, use 1<br>ft. away<br>y, use 2'<br>to tank<br>ANCE-OUTP<br>ACTUAL V<br>COD | 3600 RPM.<br>istance fr<br>1-1/4" dia<br>(, use 1-1<br>" diameter<br>fabricato | rom applia<br>ameter del<br>//2" diame<br>r delivery<br>pors @ \$186<br>OPERATH<br>RANGES | nce: 1725<br>ivery tut<br>ter delin<br>tube.<br><br>NG I<br>EERI C | i RPM<br>le;<br>ery<br>O<br>Wise<br>books<br>data<br>noise. | NSTALLATI<br>1. If blow<br>vault (<br>2" wall<br>2. Not flo<br>PERATION<br>1. RPM bel<br>2. Oversiz<br>3. Oilling<br>4. Motor n<br>STANDARD<br>CODES MET<br>Patented | ON REQUI<br>er is outs<br>e.g., 33"<br>s with air<br>od proof;<br>a MAINTE<br>ow 1500 or<br>ed air fil<br>required a<br>eeds one d       | REMENTS<br>ide, it shoul<br>x 28" x 24" c<br>intake).<br>must be prote<br>NANCE REOL<br>above 3600 r<br>ter; replacen<br>fter two year | Id be incorp<br>concrete [63<br>ected from w<br>JIREMENTS<br>not recommen<br>nent needed<br>rs of househ | norated in blo<br>120 cu. in.] v<br>weather.<br>Nded.<br>occasionally.<br>nold use. | wer<br>ault |





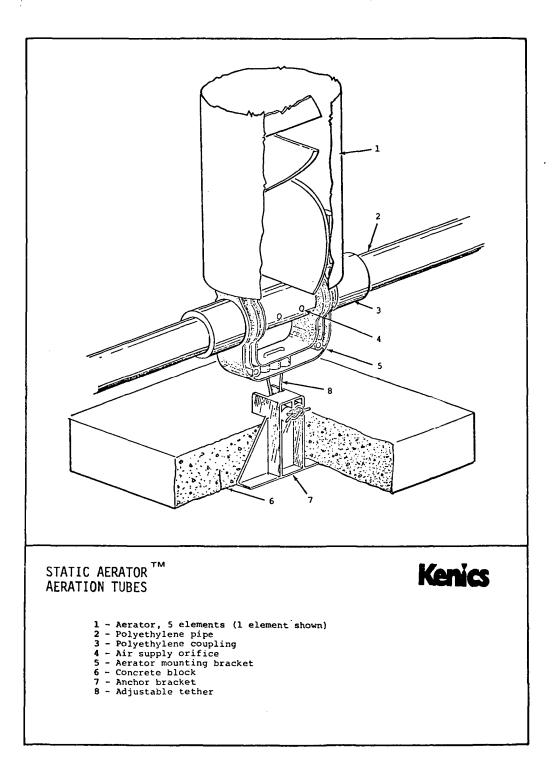
| (5                                              | 01 WES<br>AIRFIE<br>(15) 472                                | T KIRKI<br>LD, IOV<br>2-4181                            | NOOD \$<br>VA 5256                      | 6<br>6                                  | D MANUI<br>President,                                                 |                                                | NG CO.                         |                            |                                                   |                                                                               | ME                                                                                                      |                                             | A-JET                                           |                           |
|-------------------------------------------------|-------------------------------------------------------------|---------------------------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------------------------------------|------------------------------------------------|--------------------------------|----------------------------|---------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------------------------------------|---------------------------|
| mov<br>sec<br>2. Des<br>duc<br>3. Rem<br>4. Dir | or driv<br>es was<br>cond.<br>signed<br>ers for<br>noves or | te slurr<br>for use<br>r sub-fl<br>lors, di<br>aft-driv | y from<br>with co<br>oor oxi<br>scharge | pig was<br>w and p<br>dation<br>s to la | n in stee<br>tes at a<br>nig wastes<br>ditches.<br>goon.<br>xtends fr | rate of 1<br>as liqui                          | foot per<br>d flow i           | and 1<br>2<br>n- 3         | pit oxi<br>Rotatin<br>ducing<br>motion<br>Treated | from lives<br>dation dit<br>g propelle<br>dissolved<br>of liquid<br>wastes pa | tock pass thr<br>ch.<br>r accelerates<br>oxygen throug<br>disperses sol<br>ss through ov<br>g purposes. | liquid was:<br>h bubbles fo<br>ids for susp | tes in ditch.<br>or aerobic tr<br>pended treatm | intro-<br>eatmeni<br>ent. |
|                                                 |                                                             | DIMENSIO                                                | <b>us</b> 1                             |                                         |                                                                       | TANK                                           |                                | OSTS IDOLLA                |                                                   | DESIGN                                                                        | UTILITY REG                                                                                             | UIREMENTS                                   |                                                 |                           |
| MODEL<br>NUMBER<br>(MAJOR)                      | LENGTH                                                      | 1                                                       | HEIGHT                                  | WEIGHT<br>(LB.)                         | RATED<br>CAPACITY                                                     |                                                | SUGG, LIST<br>(FOB<br>FACTORY) | INSTALL                    | OPERATE                                           | DESIGN<br>LIFETIME<br>(YRS.)                                                  | ELECTRICITY<br>(RATING)                                                                                 |                                             | OPERATING<br>SUPPLIES                           | MOTOF<br>HP<br>(RPM)      |
| 18173<br>-0                                     | 18"                                                         | 14"                                                     | 23"                                     | 280                                     | 360<br>Nursery<br>Pigs                                                | NA                                             | 895.                           |                            | See<br>Costs<br>Below                             |                                                                               | 220 V AC<br>1 ph                                                                                        |                                             | Used in oxidation ditch                         | 3<br>(1800)               |
| 18173<br>-1                                     | ,,                                                          |                                                         |                                         |                                         | "                                                                     |                                                | "                              |                            |                                                   |                                                                               | 220/460 V AC<br>3 ph                                                                                    |                                             | "                                               |                           |
|                                                 |                                                             |                                                         |                                         |                                         |                                                                       |                                                |                                |                            |                                                   |                                                                               |                                                                                                         |                                             |                                                 |                           |
|                                                 |                                                             | L                                                       |                                         |                                         | L                                                                     |                                                |                                |                            |                                                   |                                                                               |                                                                                                         |                                             |                                                 |                           |
|                                                 | ic oper                                                     |                                                         |                                         |                                         |                                                                       |                                                |                                |                            |                                                   | from the                                                                      |                                                                                                         |                                             |                                                 |                           |
|                                                 | TECH                                                        |                                                         |                                         |                                         |                                                                       |                                                |                                |                            |                                                   |                                                                               |                                                                                                         |                                             |                                                 |                           |
|                                                 |                                                             | NICAL PE                                                | ON, A - A                               | CTUAL V                                 |                                                                       | OPERATII<br>RANGES                             |                                | NOISE                      | STANDARD                                          |                                                                               |                                                                                                         | <u></u>                                     |                                                 |                           |
| MODEL<br>NUMBER<br>(MAJORI<br>Both              | (R - 1<br>8005                                              | REDUCT                                                  |                                         | CTUAL V                                 |                                                                       |                                                | ien) o<br>using Hir<br>noi     | a<br>DOORS                 | STANDARD<br>CODES MET<br>Patent<br>Pending        |                                                                               |                                                                                                         |                                             |                                                 |                           |
| MAJORI                                          |                                                             | REDUCT                                                  | ON, A - A                               | CTUAL V                                 |                                                                       | RANGES<br>ITEMP, OTH<br>Indoor ho<br>submerged | ien) o<br>using Hir<br>noi     | a<br>DOORS                 | CODES MET                                         |                                                                               |                                                                                                         |                                             |                                                 |                           |
| MAJORI                                          | 800 <sub>8</sub>                                            | SE SE                                                   |                                         |                                         |                                                                       | RANGES<br>ITEMP, OTH<br>Indoor ho<br>submerged | ien) o<br>using Hir<br>noi     | a<br>pors<br>se.<br>odors. | CODES MET<br>Patent<br>Pending                    |                                                                               | ANCE                                                                                                    |                                             |                                                 |                           |
| Both                                            | 800 <sub>8</sub>                                            | SE SE                                                   |                                         |                                         |                                                                       | RANGES<br>ITEMP, OTH<br>Indoor ho<br>submerged | ien) o<br>using Hir<br>noi     | TE                         | CODES MET<br>Patent<br>Pending<br>CHNICAL         | PERFORM.                                                                      |                                                                                                         | ock use; hu:                                | July 31, 19<br>man or indust                    |                           |



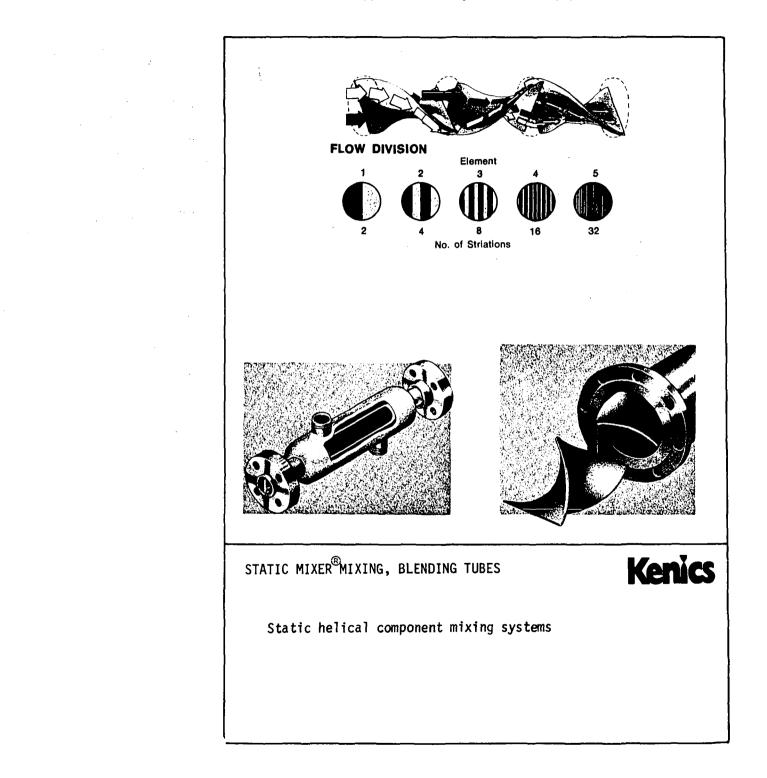
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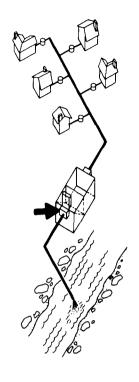
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 05) 968<br>Attn                                                                                                    |                                                                                                                                                                                                                                | lobert                                                                           | M. Bush                                                                                                | President                                                                                                                      |                                                                                    |                                                                      |                                                             |                                                                                                                                                                                                              |                                                                                                                                                        |                                                                                                                    | -SELF-INJE                                                                                  | CTING AMBIE<br>DNE/ETC.                                       | NT   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------|------|
| mi<br>ti<br>2. Mo<br>or<br>be<br>3. Mo<br>4. Av<br>ca<br>5. If                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | If-powe<br>xers har<br>ons (ae<br>ving (p<br>existi<br>tween d<br>del 106<br>erage bi<br>lly pho<br>water<br>added | ve two<br>ration<br>umped)<br>ng syst<br>rawn at<br>inject<br>ubble s<br>tograph<br>alread                                                                                                                                     | sets<br>disi<br>water<br>ten su<br>ir and<br>ts 75<br>size 0<br>hed) 0<br>y is b | of prope<br>nfection<br>require<br>oplied);<br>wastewa<br>CFM ambi<br>.050"; s<br>.00025".<br>eing pum | e-wheeling<br>llers for i<br>, etc.).<br>d for appli<br>mixer crea-<br>ter or effi<br>mallest bub<br>ped from A<br>ditional po | n-line mi<br>cation (m<br>tes turbu<br>uent.<br>200 GPM f<br>ble size<br>to B, Hyd | xing appl<br>anufactur<br>lent inte<br>low.<br>(microsco<br>rajector | i)<br>ica-<br>er<br>rface<br>pi-<br>can                     | is reac<br>lating<br>2. Negativ<br>3. One mov                                                                                                                                                                | unit is si<br>tor; second<br>blades.<br>e pressure                                                                                                     | prop has we<br>behind blade<br>water lubri                                                                         | dge-shaped,<br>s sucks in                                                                   | pellers; firs<br>cavitating,<br>ambient air.<br>ass-type" bea | vent |
| MODEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                    | DIMENSI                                                                                                                                                                                                                        | ONS                                                                              |                                                                                                        | BATER                                                                                                                          | TANK                                                                               |                                                                      | OFTS IDOLI                                                  | AR\$                                                                                                                                                                                                         | DESIGN                                                                                                                                                 | UTILITY REC                                                                                                        | UIREMENTS                                                                                   |                                                               | ſ    |
| MUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | VUMBER LENGTH WIDTH HEIGHT                                                                                         |                                                                                                                                                                                                                                |                                                                                  |                                                                                                        |                                                                                                                                | CAPACITY<br>(GAL.)                                                                 | IFOR<br>FACTORY                                                      |                                                             | COST                                                                                                                                                                                                         | LIFETIME<br>(YRS.)                                                                                                                                     | ELECTRICITY<br>(RATING)                                                                                            |                                                                                             | OPERATING<br>EUPPLIES                                         |      |
| 106                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | MODEL WILDER VIEWATH WIDTH HEIGHT (LB.)<br>MALJORI LENGTH WIDTH HEIGHT (LB.)<br>106 32" 8" round 40                |                                                                                                                                                                                                                                |                                                                                  |                                                                                                        |                                                                                                                                | NA                                                                                 | See<br>Costs<br>Below                                                | Low -<br>Varies                                             | See<br>Features<br>Above                                                                                                                                                                                     | 5-25<br>(Materials<br>dependent)                                                                                                                       | 34-17 amp -                                                                                                        |                                                                                             | Injecting<br>gas (air.g<br>etc.)                              | Ĺ    |
| 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 18"                                                                                                                | 4" 1                                                                                                                                                                                                                           | round                                                                            | 20                                                                                                     | 144,000                                                                                                                        |                                                                                    | .<br>                                                                | .<br>                                                       |                                                                                                                                                                                                              |                                                                                                                                                        | 220/440 VAC<br>3 ph 2<br>9-4.5 amp 2                                                                               |                                                                                             |                                                               | L    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b> </b>                                                                                                           | <u> </u>                                                                                                                                                                                                                       | -                                                                                |                                                                                                        | _ <b> </b>                                                                                                                     |                                                                                    |                                                                      |                                                             |                                                                                                                                                                                                              |                                                                                                                                                        |                                                                                                                    |                                                                                             |                                                               |      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                    |                                                                                                                                                                                                                                |                                                                                  |                                                                                                        | 1                                                                                                                              |                                                                                    |                                                                      |                                                             |                                                                                                                                                                                                              |                                                                                                                                                        |                                                                                                                    |                                                                                             |                                                               | L    |
| SIZING<br>1. Wi<br>2. Car<br>COSTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ll desig<br>i be usi                                                                                               | WTH P<br>an to s<br>ad for                                                                                                                                                                                                     | OTEN<br>Suit.<br>injec                                                           | TAL                                                                                                    | , oxygen, o<br>rials and a                                                                                                     |                                                                                    |                                                                      | int.                                                        | 1. Custome<br>2. Hydraje<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumping                                                                                                                               | ON REQUID<br>r provides<br>ctor should<br>plumbing s<br>& MAINTED<br>; annual bl<br>of water-e                                                         | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>NANCE REQL<br>ade inspecti<br>ffluent requ               | dard bolt f<br>ear water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al                | ipeline disch<br>allation.<br>1 installatio                   | arge |
| SIZING<br>1. Wi<br>2. Can<br>COSTS<br>1. Con                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | a GRO<br>11 design<br>1 be usi                                                                                     | WTH P<br>an to seed for<br>ted on                                                                                                                                                                                              | OTEN<br>uit.<br>injec<br>reque                                                   | TIAL<br>ting air                                                                                       | rials and a                                                                                                                    | pplicatio                                                                          | n depende                                                            | int.                                                        | ISTALLATI<br>1. Custome<br>2. Hydraje<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumping<br>in-line                                                                                                       | ON REQUID<br>r provides<br>ctor should<br>plumbing s<br>& MAINTER<br>; annual bl<br>of water-e<br>pumping no                                           | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>NANCE REQL<br>ade inspecti<br>ffluent requ               | dard bolt f<br>ear water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al                | langes.<br>ipeline disch<br>allation.                         | arge |
| SIZING<br>1. Wi<br>2. Car<br>COSTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | a GRO<br>I design<br>be usi<br>sts quo                                                                             | WTH Po<br>an to seed for<br>ted on                                                                                                                                                                                             | OTEN<br>uit.<br>injec<br>reque                                                   | TAL                                                                                                    | rials and a                                                                                                                    |                                                                                    | n depende                                                            | int.                                                        | ISTALLATI<br>1. Custome<br>2. Hydraje<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumping                                                                                                                  | ON REQUIT<br>r provides<br>ctor should<br>plumbing s<br>& MAINTEL<br>; annual bl<br>of water-e<br>pumping no                                           | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>NANCE REQL<br>ade inspecti<br>ffluent requ               | dard bolt f<br>ear water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al                | langes.<br>ipeline disch<br>allation.<br>1 installatio        | arge |
| SIZING<br>1. Wi<br>2. Cai<br>COSTS<br>1. Co<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | a GRO<br>I design<br>be usi<br>sts quo                                                                             | WTH P<br>an to s<br>ad far<br>ted on                                                                                                                                                                                           | OTEN<br>suit.<br>injec<br>reque<br>reque                                         | TAL<br>ing air<br>it, mate                                                                             | rials and a                                                                                                                    | pplicatio<br>OPERATI<br>RANGE                                                      | n depende<br>NG I<br>IER) C                                          | nt. Of                                                      | ISTALLATI<br>1. Custome:<br>2. Hydraje:<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumping<br>in-line<br>STANDARDA                                                                                        | ON REQUIT<br>r provides<br>ctor should<br>plumbing s<br>& MAINTEL<br>; annual bl<br>of water-e<br>pumping no                                           | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>NANCE REQL<br>ade inspecti<br>ffluent requ               | dard bolt f<br>ear water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al                | langes.<br>ipeline disch<br>allation.<br>1 installatio        | arge |
| SIZING<br>1. Wi<br>2. Ca<br>COSTS<br>1. Co<br>MODEL<br>MUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | a GRO<br>I desig<br>be usi<br>its quo<br>(m = -                                                                    | WTH P<br>gn to s<br>ad for<br>ted on<br>INICAL P<br>& REDUC<br>SS                                                                                                                                                              | reque:<br>reque:<br>reque:<br>TION, A                                            | TAL<br>ting air<br>t, mate                                                                             | rials and a                                                                                                                    | OPERATIO<br>RANGEI<br>(TEMP, OT)                                                   | n depende<br>NG I<br>IER) C                                          | nt. O                                                       | ISTALLATI<br>1. Custome:<br>2. Hydraje:<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumping<br>in-line<br>STANDARDE<br>CODES MET                                                                           | ON REQUIT<br>r provides<br>ctor should<br>plumbing s<br>& MAINTEL<br>; annual bl<br>of water-e<br>pumping no                                           | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>NANCE REQL<br>ade inspecti<br>ffluent requ               | dard bolt f<br>ear water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al                | langes.<br>ipeline disch<br>allation.<br>1 installatio        | arge |
| SIZING<br>1. Wi<br>2. Cal<br>COSTS<br>1. Co<br>1. Co<br>MODEL<br>IMAJORI<br>106                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TECC<br>(M -<br>BOO <sub>B</sub><br>NA                                                                             | WTH Pr<br>an to see for<br>ted on<br>INICAL P<br>& REDUC                                                                                                                                                                       | TERFOR                                                                           | TAL<br>ting air<br>t, mate                                                                             | rials and a                                                                                                                    | openatio<br>Openatii<br>RANGEI<br>(TEMP, OT)<br>Ambient                            | n depende<br>NG I<br>IER) C                                          | IN I                    | ISTALLATI<br>1. Custome<br>2. Hydraje<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumpina<br>in-line<br>STANDARDR<br>CODES MET<br>Patented                                                                 | ON REQUIT<br>r provides<br>ctor should<br>plumbing s<br>& MAINTEL<br>; annual bl<br>of water-e<br>pumping no                                           | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>NANCE REQL<br>ade inspecti<br>ffluent requ               | dard bolt f<br>ear water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al                | langes.<br>ipeline disch<br>allation.<br>1 installatio        | arge |
| SIZING<br>1. Wi<br>2. Cal<br>COSTS<br>1. Co<br>1. Co<br>MODEL<br>IMAJORI<br>106                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TECC<br>(M -<br>BOO <sub>B</sub><br>NA                                                                             | WTH Pr<br>an to see for<br>ted on<br>INICAL P<br>& REDUC                                                                                                                                                                       | TERFOR                                                                           | TAL<br>ting air<br>t, mate                                                                             | rials and a                                                                                                                    | openatio<br>Openatii<br>RANGEI<br>(TEMP, OT)<br>Ambient                            | n depende<br>NG I<br>IER) C                                          | IN I                    | ISTALLATI<br>1. Custome<br>2. Hydraje<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumpina<br>in-line<br>STANDARDR<br>CODES MET<br>Patented                                                                 | ON REQUIT<br>r provides<br>ctor should<br>plumbing s<br>& MAINTEL<br>; annual bl<br>of water-e<br>pumping no                                           | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>NANCE REQL<br>ade inspecti<br>ffluent requ               | dard bolt f<br>ear water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al                | langes.<br>ipeline disch<br>allation.<br>1 installatio        | arge |
| SIZING<br>1. 41<br>2. Cal<br>2. Cal<br>COSTS<br>1. Co<br>1. Co<br>1. Co<br>1. Co<br>1. Co<br>1. Co<br>4. Co | a GRO<br>I desis<br>t be usi<br>ts quo<br>recc.<br>(n-<br>ecos<br>tlA<br>"<br>NTIES,<br>day man                    | WTH Pd<br>an to s<br>ad for<br>ted on<br>ted on<br>ted on<br>ted on<br>ted<br>ted on<br>ted<br>ted on<br>ted<br>ted on<br>ted<br>ted on<br>ted<br>ted on<br>ted<br>ted<br>ted<br>ted<br>ted<br>ted<br>ted<br>ted<br>ted<br>ted | DTENN<br>suit.<br>injec<br>reques<br>reques<br>RA<br>DO<br>KA<br>"               | TAL<br>ting air<br>t, mate                                                                             | rials and a                                                                                                                    | openatio<br>Openatii<br>RANGEI<br>(TEMP, OT)<br>Ambient                            | n depende<br>NG I<br>IER) C                                          | int.<br>Holise<br>koolise<br>koolise<br>tet<br>inn ing<br>" | STALLATI<br>1. Custome<br>2. Hydraje<br>3. Minimal<br>PERATION<br>1. Nominal<br>2. Pumping<br>in-line<br>STANDARDM<br>CODES MET<br>Patented<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | ON REQUIP<br>r provides<br>ctor should<br>plumbing 3<br>& MAINTEI<br>; annual bi<br>of water-e<br>pumping no<br>PERFORM/<br>atent No. 3<br>atents pond | REMENTS<br>mating, stan<br>be placed n<br>kills requir<br>vanCE REQU<br>de inspecti<br>ffluent requ<br>t existing, | dard bolt f<br>car water p<br>ed for inst<br>JIREMENTS<br>on.<br>ired for al<br>manufacture | langes.<br>ipeline disch<br>allation.<br>1 installatio        | arge |

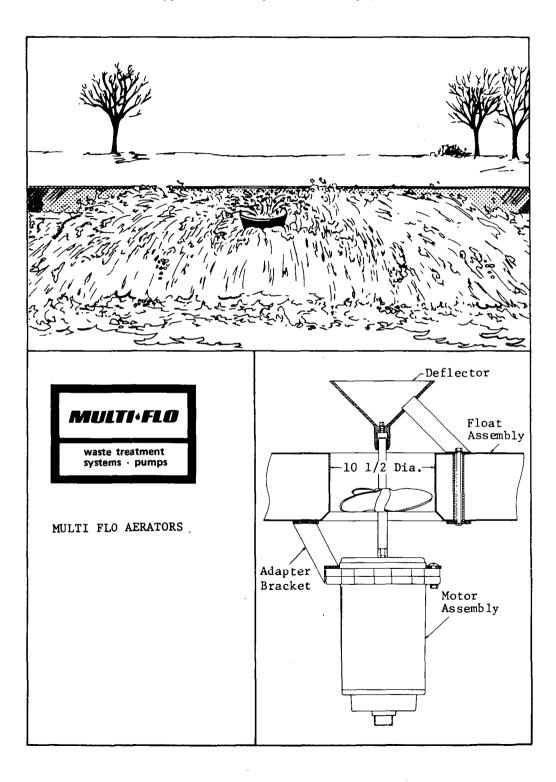


| 2. Use<br>3. Tur                                                                        | eral h<br>which d<br>prima                                               | elical<br>hir is<br>hrily i<br>flow,                           | stat<br>bubb<br>in lag                                       | ic mixer<br>led for tu<br>goons and                                                                        | components<br>urbulent f<br>aeration                             | ethylene t<br>; (see pag<br>low DO tra<br>tanks.<br>for liquic                                                  | e 250).<br>nsfer.                                            | f                | of an a<br>2. Air is<br>in surn<br>3. As the<br>mixing<br>bubble                                                     | pumped in<br>aeration ch<br>released i<br>rounding li<br>air bubble<br>and oxygen<br>size and i                                   | small diamet<br>amber, to the<br>nto the base<br>quid.<br>s and liquid<br>water inter<br>increasing DO  | COMPONEN<br>er lines, we<br>he base of th<br>of the weig<br>move up the<br>face occurs,<br>content of<br>cle with sur | ighted to the<br>e aerator.<br>hted aerator<br>module, tur<br>breaking do<br>water. |        |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------|
| MODEL                                                                                   |                                                                          | DIMENSI                                                        |                                                              | WEIGH                                                                                                      | RATED                                                            | TANK                                                                                                            | a                                                            | ETS (DOLL        | ARE                                                                                                                  | DESIGN                                                                                                                            | UTILITY RE                                                                                              | OUREMENTS                                                                                                             | OPERATING                                                                           |        |
| MUMBER<br>(MAJOR)                                                                       | LENGTH                                                                   | WIDTH                                                          | HE                                                           |                                                                                                            |                                                                  | (GAL.)                                                                                                          | SUGG, LIST<br>(FOB<br>FACTORY)                               | INSTALL<br>COST  | OPERATE<br>COST                                                                                                      | "LIFETIME<br>(YRE.)                                                                                                               | ELECTRICITY<br>(RATING)                                                                                 | OTHER                                                                                                                 |                                                                                     |        |
| Static<br>Aerator                                                                       | 12" 1                                                                    | pund                                                           |                                                              | 5' 15                                                                                                      | 1000                                                             | NA                                                                                                              | See<br>Costs<br>Below                                        | Varies           |                                                                                                                      | Plastic -<br>unlimited                                                                                                            |                                                                                                         | Compressed<br>Air                                                                                                     | Air and<br>liquid                                                                   |        |
|                                                                                         |                                                                          |                                                                | +                                                            |                                                                                                            |                                                                  |                                                                                                                 |                                                              |                  |                                                                                                                      |                                                                                                                                   |                                                                                                         |                                                                                                                       |                                                                                     |        |
|                                                                                         |                                                                          | <u> </u>                                                       | +-                                                           |                                                                                                            | 1                                                                |                                                                                                                 |                                                              |                  | -                                                                                                                    | 1                                                                                                                                 |                                                                                                         | <u> </u>                                                                                                              |                                                                                     | ,      |
| or<br>aer<br>2. Can<br><b>COSTS</b><br>1. Aer                                           | ators é<br>be use<br>ators p                                             | of flo<br>)   per<br>d in a<br>priced                          | w; fc<br>1500<br>erati                                       | er example)<br>sq. ft.<br>ion tanks<br>uantity or                                                          | e, in a 20<br>might be<br>at treatm<br>rdered; fo                | ft. deep<br>sufficient<br>ent plants<br>r 1 to 50<br>50 per aer                                                 | agoon, 1<br>, also.                                          | 2"<br>  Of       | lines n<br>2. Aerator<br>install<br>PERATION<br>1. Operat<br>content<br>2. Mainten                                   | nust be weig<br>rs should bi<br>ler/sanitar;<br>J& MAINTE<br>ion of blow<br>t by the am<br>nance small                            | phted down.<br>e anchored d<br>v engineer.<br>NANCE REQ<br>er, calculat<br>punt of mixi<br>, turbulance | own, fitted<br>UIREMENTS<br>ion of actua<br>ng necessary<br>cleans aera                                               | l and desire                                                                        |        |
| or<br>aer<br>2. Can<br>COSTS<br>1. Aer<br>\$30                                          | volume<br>ators (<br>be use<br>ators (<br>0 per a                        | of flo<br>) per<br>d in a<br>priced<br>lerator                 | w; fc<br>1500<br>erat1<br>by qu<br>; for                     | <pre>pr example<br/>) sq. ft.<br/>ion tanks<br/>pantity or<br/>- 100+ aer<br/>MARCE-OUT</pre>              | e, in a 20<br>might be<br>at treatm<br>rdered: fo<br>rators, \$1 | ft. deep<br>sufficient<br>ent plants<br>r 1 to 50<br>50 per aer                                                 | lagoon, 1<br>, also.<br>aerators,<br>ator.                   | 2"               | lines n<br>2. Aerator<br>instal<br>PERATION<br>1. Operat<br>content<br>2. Mainter<br>checkin                         | must be weig<br>rs should bi<br>ler/sanitar;<br><b>J&amp; MAINTE</b><br>ion of blow<br>t by the am<br>nance small<br>ng of system | phted down.<br>e anchored d<br>v engineer.<br>NANCE REQ<br>er, calculat<br>punt of mixi<br>, turbulance | own, fitted<br>UIREMENTS<br>ion of actua<br>ng necessary                                                              | and sized by<br>1 and desire<br>for proper                                          |        |
| or<br>aer<br>2. Can<br><b>COSTS</b><br>1. Aer<br>\$30                                   | volume<br>ators (<br>be use<br>ators (<br>0 per a                        | of flo<br>) per<br>d in a<br>priced<br>lerator                 | w; fc<br>1500<br>erat1<br>by qu<br>; for                     | pr example<br>) sq. ft.<br>on tanks<br>uantity or<br>- 100+ acr                                            | e, in a 20<br>might be<br>at treatm<br>rdered: fo<br>rators, \$1 | ft. deep<br>sufficient<br>ent plants<br>r l to 50                                                               | lagoon, l<br>, also.<br>aerators,<br>ator.                   | 2"<br>  Of       | lines n<br>2. Aerator<br>install<br>PERATION<br>1. Operat<br>content<br>2. Mainten                                   | must be wein<br>rs should bi<br>ler/sanitary<br>d & MAINTE<br>ion of blow<br>t by the am<br>nance small<br>ng of system           | phted down.<br>e anchored d<br>v engineer.<br>NANCE REQ<br>er, calculat<br>punt of mixi<br>, turbulance | own, fitted<br>UIREMENTS<br>ion of actua<br>ng necessary<br>cleans aera                                               | and sized b<br>1 and desir<br>for proper                                            | ,<br>, |
| or<br>aer<br>2. Can<br>COSTS<br>1. Aer<br>\$30<br>MODEL                                 | volume<br>ators (<br>be use<br>ators (<br>0 per a<br>TECH<br>(R-1        | of flo<br>l per<br>d in a<br>priced<br>merator                 | w; fc<br>1500<br>erat1<br>by qu<br>; for<br>erfor            | <pre>pr example<br/>) sq. ft.<br/>ion tanks<br/>pantity or<br/>100+ aer<br/>MAACE-OUT<br/>A - ACTUAL</pre> | e, in a 20<br>might be<br>at treatm<br>rdered: fo<br>rators, \$1 | ft. deep<br>sufficient<br>ent plants<br>r 1 to 50<br>50 per aer<br>OPERATH<br>RANGE                             | lagoon, 1<br>, also.<br>aerators,<br>ator.<br>MG N<br>HERI C | 2"<br>Of<br>015E | lines of<br>Aerator<br>install<br>PERATION<br>1. Operaticonteni<br>2. Maintei<br>checkii                             | must be wein<br>rs should bi<br>ler/sanitary<br>d & MAINTE<br>ion of blow<br>t by the am<br>nance small<br>ng of system           | phted down.<br>e anchored d<br>v engineer.<br>NANCE REQ<br>er, calculat<br>punt of mixi<br>, turbulance | own, fitted<br>UIREMENTS<br>ion of actua<br>ng necessary<br>cleans aera                                               | and sized by<br>1 and desire<br>for proper                                          | ,<br>, |
| or<br>aer<br>2. Can<br>COSTS<br>1. Aer<br>\$30<br>NUMBER<br>NUMBER<br>(MAJOR)<br>Static | volume<br>ators 6<br>be use<br>ators 10<br>0 per 2<br>0 per 2<br>0 per 2 | of flo<br>l per<br>d in a<br>priced<br>mical Pi<br>REDUC<br>SS | w; fc<br>1500<br>erati<br>by qu<br>; for<br>ERFOR<br>TION, J | m example<br>) sq. ft.<br>on tanks<br>wantity or<br>- 100+ aer<br>MAACE-OUT<br>A - ACTUAL                  | e, in a 20<br>might be<br>at treatm<br>rdered: fo<br>rators, \$1 | ft. deep<br>sufficient<br>ent plants<br>r 1 to 50<br>50 per aer<br>OPERATH<br>RANGES<br>(TEMP, OT)<br>Submerged | lagoon, 1<br>, also.<br>aerators,<br>ator.<br>MG N<br>HERI C | 2"<br>Of<br>015E | lines n<br>2. Aerator<br>install<br><b>ERATION</b><br>1. Operat<br>content<br>checkin<br><b>STANDARC</b><br>CODES ME | must be wein<br>rs should bi<br>ler/sanitary<br>d & MAINTE<br>ion of blow<br>t by the am<br>nance small<br>ng of system           | phted down.<br>e anchored d<br>v engineer.<br>NANCE REQ<br>er, calculat<br>punt of mixi<br>, turbulance | own, fitted<br>UIREMENTS<br>ion of actua<br>ng necessary<br>cleans aera                                               | and sized by<br>1 and desire<br>for proper                                          | ,<br>, |

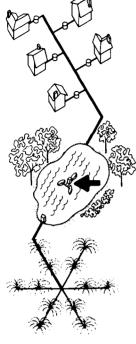


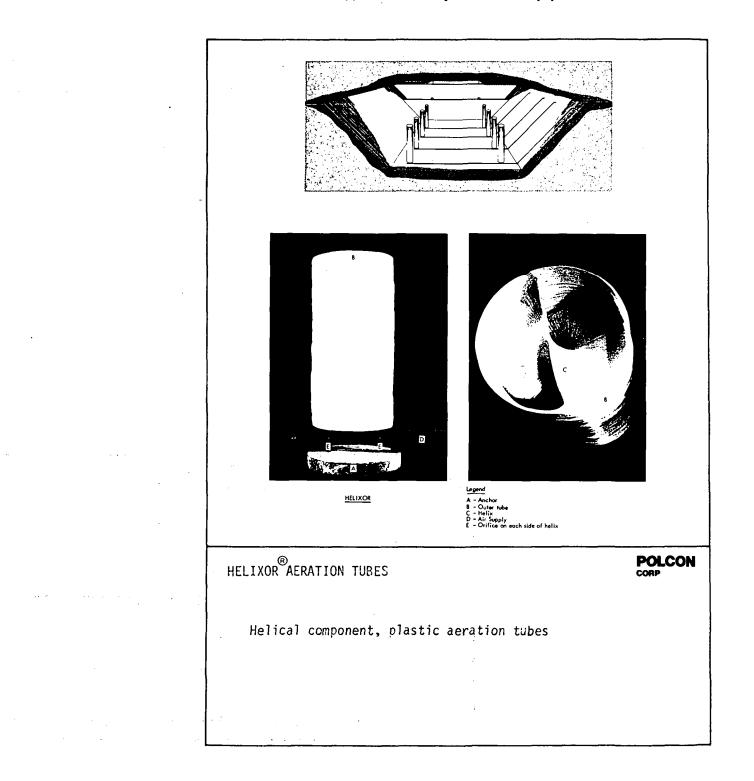
| 2. Use                                                                                    | ed int<br>glass<br>d for                                                                                                                                                                                                              | ernal<br>and P¥<br>blendi                                                                     | inless<br>helica<br>C.)<br>ng, mi                                                 | steel o<br>l elemen<br>ixing, or                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ts. (Stand<br>dispersio                                                        | teel tubes<br>ard module<br>n in-line                                                                                                                                                                                                                               | es availa<br>operatio                                  | to 21<br>ble                                                                                          | through<br>2. As the<br>static                                                                                                                                                                         | or liquid<br>(in-line)<br>liquids pa<br>helical co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | -gas component<br>mixer moduliss through the<br>mponents, file                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | nts to be m<br>es.<br>he modules<br>ow division                      | ixed are pumpe<br>and are mixed<br>, inversion, re<br>dispersion of | d<br>by t                 |
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| moc<br>and<br>4. Pla<br>5. No                                                             | modules with specially scaled internal edges (1/2" - 12"),<br>and Custom modules (3/16" - 48") of most any material.<br>. Plain, flanged or threaded ends.<br>. No moving parts, flow stratification provides for oxygen<br>transfer. |                                                                                               |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| MODEL                                                                                     |                                                                                                                                                                                                                                       | DIMENS                                                                                        |                                                                                   | WEIGH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| КМОD-<br>10                                                                               | 1/2"                                                                                                                                                                                                                                  | to 12                                                                                         | " 0.5<br>9.                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| К <b>М</b> ОД-<br>20                                                                      | 1/2"                                                                                                                                                                                                                                  | to 3                                                                                          | . 2.6                                                                             | 3'-<br>.5'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                |                                                                                                                                                                                                                                                                     | 420 - 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| ava<br>COSTS<br>1. Lis                                                                    | sizes<br>ilable                                                                                                                                                                                                                       | of mi<br>for d                                                                                | xers o<br>esired                                                                  | of differ<br>d mixing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | connectio                                                                      | als and pu<br>ns. End c<br>(1) Male p                                                                                                                                                                                                                               | onnectio                                               | ns.                                                                                                   | 2. Plumbin<br>PERATION<br>1. Operati<br>blended                                                                                                                                                        | <pre>6 installed<br/>ig skills:<br/>6 MAINTE<br/>on of mixe<br/>compound</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculatio<br>content by t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ed or threa<br>UIREMENTS<br>on of actua                              | ded ends.                                                           |                           |
| 1. A11<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6                                            | sizes<br>ilable<br>t cost<br>talled<br>- \$31;                                                                                                                                                                                        | of mi<br>for d<br>s do n<br>, cost<br>(2) S                                                   | xers o<br>esired<br>ot inc<br>(for<br>tainle                                      | f differ<br>mixing.<br>lude end<br>l/2" - 1;<br>ess steel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | connectio                                                                      | ns. End c<br>(1) Male p<br>50 PSI), 1                                                                                                                                                                                                                               | onnectio                                               | ns.                                                                                                   | <ol> <li>Must be</li> <li>Plumbin</li> <li>PERATION         <ol> <li>Operati</li> <li>blended</li> <li>for pro</li> <li>Mainten</li> </ol> </li> </ol>                                                 | <pre>&amp; installed<br/>ig skills:</pre>                                                                                                                                                                                                                                                                                                                                                    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                                                                                                                                                              | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. A11<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6                                            | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | of mi<br>for d<br>s do n<br>, cost<br>(2) S<br>n stee                                         | xers o<br>esired<br>ot inc<br>(for<br>tainle<br>] flan                            | f differ<br>mixing.<br>lude end<br>l/2" - 1;<br>ess steel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. 'End c<br>(1) Male p<br>50 PSI), 1<br>- \$184.<br>OPERATE                                                                                                                                                                                                       | connectio<br>Dipe thre<br>144 - \$49                   | ns.                                                                                                   | <ol> <li>Must be</li> <li>Plumbin</li> <li>PERATION         <ol> <li>Operati</li> <li>blended</li> <li>for pro</li> <li>Mainten</li> </ol> </li> </ol>                                                 | <pre>a installed<br/>ig skills:</pre>                                                                                                                                                                                                                                                                                                                                                        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| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6<br>(3)                                     | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | of mi<br>for d<br>s do n<br>, cost<br>(2) S<br>n stee                                         | xers o<br>esired<br>ot inc<br>(for<br>tainle<br>] flan                            | in differi<br>i mixing.<br>1/2" - 1:<br>1/2" | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. 'End c<br>(1) Male p<br>50 PSI), 1<br>5184.<br>OPERATI<br>RANGE:<br>(TEMP, OTF                                                                                                                                                                                  | connectio<br>bipe thre<br>44 - \$49<br>NG<br>(ER)      | ns,<br>ad,<br>6;<br>NOISE                                                                             | <ol> <li>Must be</li> <li>Plumbin</li> <li>PERATION</li> <li>Operati</li> <li>blended</li> <li>for pro</li> <li>Mainten</li> <li>of syst</li> </ol>                                                    | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                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| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6<br>(3)<br>MODEL<br>MUMBER                  | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | of mi<br>for d<br>s do n<br>, cost<br>(2) S<br>n stee                                         | xers o<br>esired<br>ot inc<br>(for<br>tainle<br>] flan                            | and the second s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. 'End c<br>(1) Male p<br>50 PSI), 1<br>5184.<br>OPERATH<br>RANGES                                                                                                                                                                                                | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>NOISE                                                                             | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst                                                                                                      | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6<br>(3)<br>MODEL<br>NUMBER<br>(MAJOR)       | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | s do n<br>, cost<br>(2) S<br>n stee<br>NICAL J<br>% REDUK                                     | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>) flan<br>PERFOR<br>TION, A<br>DO | ilude end<br>1/2" - 1:<br>ss steel<br>ige (150 J<br>AACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. End c<br>(1) Male p<br>50 PSI), <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>NOISE                                                                             | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDARDA<br>CODES MET                                                                            | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6<br>(3)<br>MODEL<br>NUMBER<br>(MAJOR)       | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | s do n<br>, cost<br>(2) S<br>n stee<br>NICAL J<br>% REDUK                                     | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>) flan<br>PERFOR<br>TION, A<br>DO | ilude end<br>1/2" - 1:<br>ss steel<br>ige (150 J<br>AACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. End c<br>(1) Male p<br>50 PSI), <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>NOISE                                                                             | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDARDA<br>CODES MET                                                                            | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6<br>(3)<br>MODEL<br>NUMBER<br>(MAJOR)       | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | s do n<br>, cost<br>(2) S<br>n stee<br>NICAL J<br>% REDUK                                     | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>) flan<br>PERFOR<br>TION, A<br>DO | ilude end<br>1/2" - 1:<br>ss steel<br>ige (150 J<br>AACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. End c<br>(1) Male p<br>50 PSI), <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>NOISE                                                                             | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDARDA<br>CODES MET                                                                            | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6<br>(3)<br>MODEL<br>NUMBER<br>(MAJOR)       | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | s do n<br>, cost<br>(2) S<br>n stee<br>NICAL J<br>% REDUK                                     | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>) flan<br>PERFOR<br>TION, A<br>DO | ilude end<br>1/2" - 1:<br>ss steel<br>ige (150 J<br>AACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. End c<br>(1) Male p<br>50 PSI), <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>NOISE                                                                             | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDARDA<br>CODES MET                                                                            | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>\$6<br>(3)<br>MODEL<br>NUMBER<br>(MAJOR)       | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | s do n<br>, cost<br>(2) S<br>n stee<br>NICAL J<br>% REDUK                                     | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>) flan<br>PERFOR<br>TION, A<br>DO | ilude end<br>1/2" - 1:<br>ss steel<br>ige (150 J<br>AACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. End c<br>(1) Male p<br>50 PSI), <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>NOISE                                                                             | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDARDA<br>CODES MET                                                                            | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>S6<br>(3)<br>MODEL<br>MUMBER<br>(MAJOR)<br>All | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo<br>NA                                                                                                                                                                         | of min<br>for d<br>s do n<br>, cost<br>(2) S<br>n stee<br>MICAL<br>S<br>REDUX<br>S<br>S<br>NA | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>1 flan<br>PERFOR<br>NA            | of differ<br>i mixing.<br>1/2" - 1:<br>iss steel<br>ige (150 I<br>AMARCE OUT<br>- ACTUAL<br>COD<br>NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | connection<br>* KPS):<br>flange (1<br>SI). \$25<br>PUT<br>VALUE)               | ns. End (<br>(1) Male (<br>50 PSI), 1<br>- \$184.<br>OPERATI<br>RANGE!<br>ITEMP.0TH<br>Unlimitec<br>heat tran<br>capabilit                                                                                                                                          | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>• | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDARDA<br>COOLS MET<br>Patented                                                                | e installed<br>g skills:<br>a MAINTE<br>on of mixe<br>compound<br>per contro<br>ince small<br>m by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by tl<br>l.<br>, turbulence<br>ating engines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ed or threa                                                          | ded ends.<br>and desired<br>f mixing neces<br>ers; periodic         | sary                      |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>S6<br>(3)<br>MODEL<br>MUMBER<br>(MAJOR)<br>All | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo<br>NA                                                                                                                                                                         | of min<br>for d<br>s do n<br>, cost<br>(2) S<br>n stee<br>MICAL<br>S<br>REDUX<br>S<br>S<br>NA | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>1 flan<br>PERFOR<br>NA            | of differ<br>i mixing.<br>1/2" - 1:<br>iss steel<br>ige (150 I<br>AMARCE OUT<br>- ACTUAL<br>COD<br>NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | connection<br>* RPS):<br>flange (1):<br>ssi), \$25<br>value)<br>value<br>value | ns. End (<br>(1) Male (<br>50 PSI), 1<br>- \$184.<br>OPERATI<br>RANGE!<br>ITEMP.0TH<br>Unlimitec<br>heat tran<br>capabilit                                                                                                                                          | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>•<br>• | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDADDE<br>CODES MET<br>Patented<br>FECHNICAL<br>1. Patente<br>countri<br>2. Fressur<br>5-6 tim | PERFORM.<br>d, 3,286.9<br>es.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by tl<br>l.<br>, turbulence<br>ating engine<br>ating engine<br>engine<br>flow w                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ented in pr                                                          | ded ends.                                                           | sary<br>chec              |
| 1. All<br>ava<br>COSTS<br>1. Lis<br>ins<br>S6<br>(3)<br>MODEL<br>MUMBER<br>(MAJOR)<br>All | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo<br>NA                                                                                                                                                                         | of min<br>for d<br>s do n<br>, cost<br>(2) S<br>n stee<br>MICAL<br>S<br>REDUX<br>S<br>S<br>NA | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>1 flan<br>PERFOR<br>NA            | of differ<br>i mixing.<br>1/2" - 1:<br>iss steel<br>ige (150 I<br>AMARCE OUT<br>- ACTUAL<br>COD<br>NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | connection<br>* RPS):<br>flange (1):<br>ssi), \$25<br>value)<br>value<br>value | ns. End (<br>(1) Male (<br>50 PSI), 1<br>- \$184.<br>OPERATI<br>RANGE!<br>ITEMP.0TH<br>Unlimitec<br>heat tran<br>capabilit                                                                                                                                          | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns, ad, 6;<br>wouse<br>booons                                                                         | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDADDE<br>CODES MET<br>Patented<br>FECHNICAL<br>1. Patente<br>countri<br>2. Fressur<br>5-6 tim | PERFORM.<br>d. 3,286.9<br>es. for ps of the second | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence<br>ating engines<br>ating en | ented in pr<br>e of same d<br>ithout ripp                            | ded ends.                                                           | sary<br>chec<br>n<br>e fr |
| All<br>ava<br>TS<br>Lis<br>ins<br>S6<br>(3)<br>XEL<br>BER<br>JOR)                         | sizes<br>ilable<br>t cost<br>talled<br>- \$31;<br>Carbo                                                                                                                                                                               | s do n<br>, cost<br>(2) S<br>n stee<br>NICAL J<br>% REDUK                                     | xers c<br>esired<br>ot inc<br>(for<br>tainle<br>) flan<br>PERFOR<br>TION, A<br>DO | ilude end<br>1/2" - 1:<br>ss steel<br>ige (150 J<br>AACTUAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | connection<br>" NPS):<br>flange (1<br>SI), \$25<br>PUT                         | ns. End c<br>(1) Male p<br>50 PSI), <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>50 PSI, <b>1</b><br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7<br>7 | connectio<br>ijpe thre<br>i44 - \$49<br>wg<br>s<br>ter | ns,<br>ad,<br>6;<br>NOISE                                                                             | 1. Must be<br>2. Plumbin<br>PERATION<br>1. Operati<br>blended<br>for pro<br>2. Mainten<br>of syst<br>STANDARDA                                                                                         | a installed<br>ig skills:<br>a MAINTE<br>on of mixe<br>i compound<br>iper contro<br>nance small<br>em by oper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | in-line wit<br>plain flang<br>NANCE REOM<br>r, calculati<br>content by ti<br>l.<br>, turbulence                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ed or threa<br>UIREMENTS<br>on of actua<br>he amount o<br>cleans mix | ded ends.<br>and desired<br>f mixing nece<br>ers; periodic          | s                         |



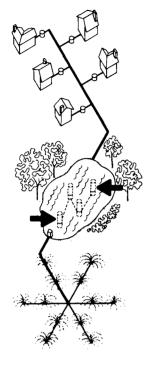


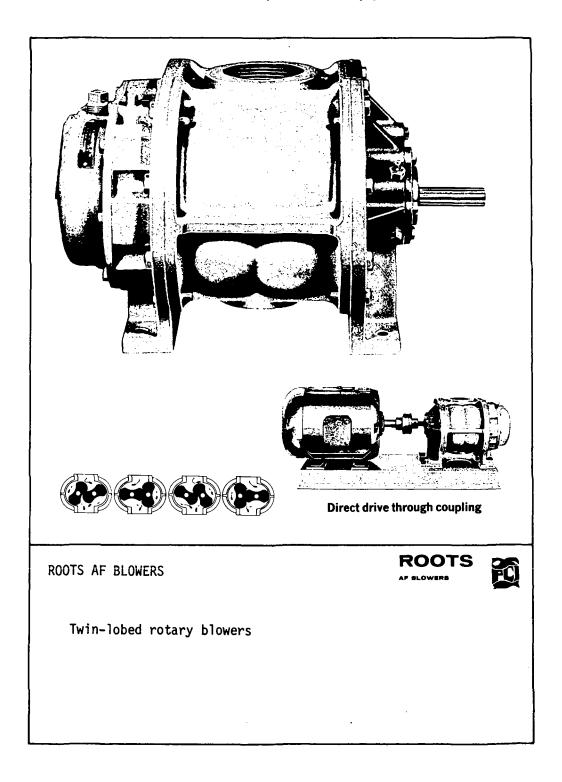
| sha<br>2. Sut<br>fto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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   | igoon or<br>er stabili                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | lers an<br>2. Turbule<br>oxygen                                                                                                                                             | aerator s<br>d discharg<br>nt interfa<br>in water f                                                                        | ucks wastewat<br>es against de<br>ce of wastewa<br>or aerobic tr<br>rated water a                                | flector.<br>ter and air<br>eatment of w | increases |
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| 4. Propeller-deflector mechanism.<br>model DIMENSIONS WEIGHT RATED TANK COSTS (DOLLARS) DESIGN UTILITY REQUIREMENTS<br>NUMBER LENGTH WIDTH HEIGHT (L.R.)<br>(RADO) LOSTS (DOLLARS) DESIGN UTILITY REQUIREMENTS<br>(RADO) LOSTS (DOLLARS) DESIGN UTILITY REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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               | SUGG, LIST                                                               | T                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                             | LIFETIME                                                                                                                   |                                                                                                                  |                                         |           |
| (MAJOH)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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               | FACTORY)                                                                 | Min ima 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | COST<br>Minimal                                                                                                                                                             | 3-5                                                                                                                        | (RATING)<br>120 V AC                                                                                             |                                         | None      |
| SA-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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                                                                                                                                         | ;) (Varies)<br>"                                                                                                                                                            |                                                                                                                            | 1 HP<br>230/460 V AC                                                                                             |                                         | ""        |
| SA-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| SA-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| SIZING<br>1. Cap<br>cor<br>COSTS<br>1. Ele                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                 | rer. O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ISTALLATION<br>1. No spec<br>2. Anchor of<br>PERATION<br>1. Semi-an                                                                                                         | ON REQUI<br>ial skills<br>mooring ca<br>& MAINTE<br>nual inspe                                                             | required bey<br>bles and atta                                                                                    | ch electrica<br>H <b>REMENTS</b>        |           |
| SIZING<br>1. Cap<br>cor<br>COSTS<br>1. Ele<br>2. Cor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | acity of the spond state of the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | VTH PO<br>depends<br>ding det<br>cable<br>quipment                                                                                                                   | and moo                                                                                                                | L<br>nt of t<br>times.<br>ring ca<br>led by i                                        | reatment<br>bles furr<br>nstaller. | required                                                    | and<br>ranufactu                                                         | rer. O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ISTALLATION<br>1. No spec<br>2. Anchor of<br>PERATION<br>1. Semi-an                                                                                                         | ON REQUI<br>ial skills<br>mooring ca<br>& MAINTE<br>nual inspe                                                             | required bey<br>bles and atta<br>NANCE REQU<br>ction.                                                            | ch electrica<br>H <b>REMENTS</b>        |           |
| SIZING<br>1. Cap<br>cor<br>COSTS<br>1. Ele                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                 | rer. O                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ISTALLATION<br>1. No spec<br>2. Anchor of<br>PERATION<br>1. Semi-an                                                                                                         | ON REQUI<br>ial skills<br>mooring ca<br>& MAINTE<br>nual inspe<br>al oil cha                                               | required bey<br>bles and atta<br>NANCE REQU<br>ction.                                                            | ch electrica<br>H <b>REMENTS</b>        |           |
| SIZING<br>1. Cap<br>cor<br>COSTS<br>1. Ele<br>2. Cor<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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C<br>Min<br>ites noi                      | rer. 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No spec<br>2. Anchor 1<br>PERATION<br>1. Semi-annu<br>2. Bi-annu<br>STANDARD3                                                                               | ON REQUI<br>ial skills<br>mooring ca<br><b>&amp; MAINTE</b><br>nual inspe<br>al oil cha                                    | required bey<br>bles and atta<br>NANCE REQU<br>ction.                                                            | ch electrica<br>H <b>REMENTS</b>        |           |
| SIZING<br>1. Car<br>cor<br>COSTS<br>1. Ele<br>2. Cor<br>MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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C<br>Min<br>ites noi                      | rer. Of or 3 se.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ISTALLATI<br>1. No spec<br>2. Anchor I<br>PERATION<br>1. Semi-an<br>2. Bi-annu<br>STANDARDI<br>CODES MET<br>Patent                                                          | ON REQUI<br>ial skills<br>mooring ca<br><b>&amp; MAINTE</b><br>nual inspe<br>al oil cha                                    | required bey<br>bles and atta<br>NANCE REQU<br>ction.                                                            | ch electrica<br>H <b>REMENTS</b>        |           |
| SIZING<br>1. Car<br>cor<br>COSTS<br>1. Ele<br>2. Cor<br>MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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C<br>Min<br>ites noi                      | rer. Of or 3 se.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ISTALLATI<br>1. No spec<br>2. Anchor I<br>PERATION<br>1. Semi-an<br>2. Bi-annu<br>STANDARDI<br>CODES MET<br>Patent                                                          | ON REQUI<br>ial skills<br>mooring ca<br><b>&amp; MAINTE</b><br>nual inspe<br>al oil cha                                    | required bey<br>bles and atta<br>NANCE REQU<br>ction.                                                            | ch electrica<br>H <b>REMENTS</b>        |           |
| SIZING<br>1. Car<br>cor<br>COSTS<br>1. Ele<br>2. Cor<br>MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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crespone<br>cctrical<br>recursion<br>recursion<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active<br>active | VTH PO<br>lepends<br>iing det<br>i cable<br>uuipmen:<br>NNICAL PE<br>S                                                                                               | TENTIA<br>on amou<br>cention<br>and moo<br>provid<br>RFOFMAN<br>ION, A - A<br>DO 2 CO                                  | L<br>nt of t<br>times.                                                               | reatment<br>bles furn<br>nstaller. | required<br>ished by<br>OPERATII<br>RANGES<br>(TEMP, OTH    | and<br>ranufactu                                                         | orer. Of oboxs<br>occass<br>or 3<br>odors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ISTALLATI<br>1. No spec<br>2. Anchor (<br>PERATION<br>1. Semi-an<br>2. B1-annu<br>STANDARDA<br>CODES MET<br>Patent<br>applied fo                                            | ON REQUI<br>ial skills<br>mooring ca<br><b>&amp; MAINTE</b><br>nual inspe<br>al oil cha                                    | required bey<br>bles and atta<br>NANCE REQU<br>ction.                                                            | ch electrica<br>H <b>REMENTS</b>        |           |
| SIZING<br>1. Car<br>cost<br>2. Cor<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>1. Ele<br>2. Cor<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL<br>MODEL | B GROM<br>acity c<br>respondence<br>introl ec<br>PROP 2<br>BODy 2<br>PROP 2<br>BODy 2<br>PROP                                                                                                                                                                                                                                                                                                                                                                         | VTH PO<br>Jepends<br>ing det<br>i cable<br>i cable<br>i cable<br>suipment<br>si<br>si<br>b<br>perduction<br>si<br>si<br>si<br>si<br>si<br>si<br>si<br>si<br>si<br>si | TENTIA<br>on atrou<br>cention<br>and moo<br>: provid<br>RFORMAN<br>A<br>DO 2 CO<br>ion; DO<br>VTEES, 4<br>and to and t | L<br>nt of t times.<br>iring ca<br>ed by i<br>increa<br>b increa<br>b SERV<br>rained | reatment<br>bles furn<br>nstaller. | openation<br>manages<br>(TEMP, OTH<br>All clima<br>ship and | and<br>ranufactu<br>NG NG<br>Ites noi<br>3<br>Submer<br>material.<br>ps. | rer. Of other states of the st | ISTALLATI<br>1. No spec<br>2. Anchor 1<br>PERATION<br>1. Semi-an<br>2. Bi-annu<br>STANDARDI<br>CODES MET<br>Patent<br>applied fo<br>pr.<br>ECHNICAL<br>1. Oxygen            | ON REQUI<br>ial skills<br>mooring ca<br>a MAINTE<br>nual inspe<br>al oil cha<br>r.<br>PERFORM<br>transfer r<br>d applicate | required bey<br>bles and atta<br>NANCE REQU<br>ction.<br>nge recommend<br>ANCE<br>ate in excess<br>to n data for | of 1.3 lb.                              | a) cable. |
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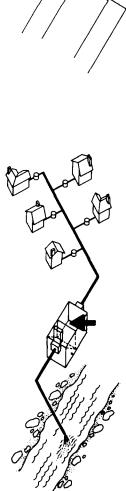


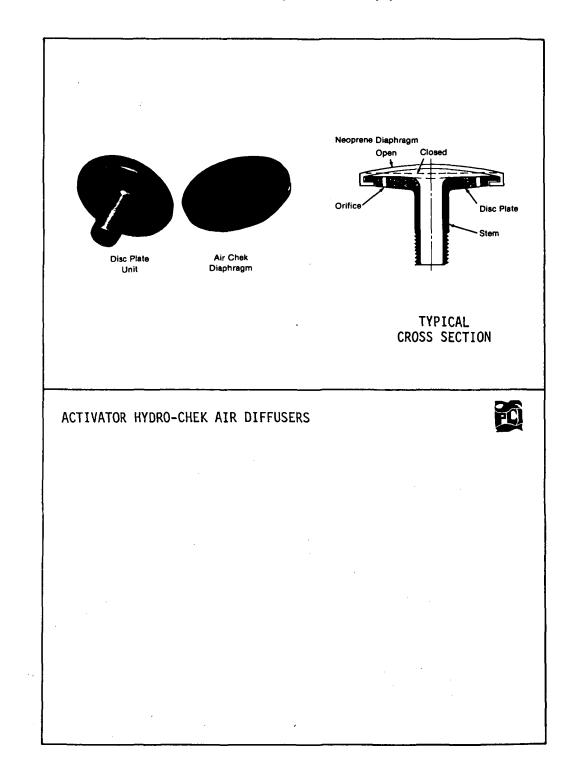
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Use                                                                                                    | e-piece<br>thic he<br>mbined                                                       | lix cor<br>with li                      | nponent<br>iquid f                                                                                                            | t into w<br>for DO t<br>pration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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Air is<br>helical<br>lift.<br>3. As the<br>turbule<br>the DO                                                                                                                                                    | pumped to<br>weighted t<br>released t<br>component<br>air bubble<br>nt mixing<br>of the wat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | the base of 1<br>c the bottor.<br>hrough two on<br>pulling up<br>s ard liquid<br>and oxygen-wa<br>er.<br>aves, to recy                                                           | of an aerat<br>rifices to e<br>surrounding<br>flow moves<br>ater interfa                                                                              | ion chamber.<br>ach side of f<br>liquid as ar<br>up the modu <sup>2</sup> 6<br>ce occurs, ir                                             | ;he<br>h a<br>e,  |
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Mainten<br>checkin<br>stanoard<br>CODES MET                                                                                                    | ons, a blo<br>les weighte<br>s should b<br>er/sanitar<br><b>&amp; MAINTE</b><br>on of blow<br>. by mixing<br>hance small<br>g of syste<br>s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | wer source mi<br>d down.<br>e anchored do<br>y engineer.<br>NANCE REQU<br>er, calculat<br>necessary fo<br>; turbulence                                                           | own, fitted<br>UIREMENTS<br>ion of actua<br>or proper co<br>cleans aera                                                                               | and sized by<br>1 and desired<br>ntrol.<br>tors, periodi                                                                                 | qu<br>D           |
| 2. Pol<br>500<br>COSTS<br>1. Lis<br>acc<br>2. Pri<br>MODEL<br>NUMBER<br>IMAJOR<br>Helixor<br>WARRAI<br>1. 1 y<br>2. Mur | con al<br>0 to 4<br>t price<br>essori<br>IR -<br>BOOs<br>BOOs<br>NTIES,<br>rear wa | GUARAArranty                            | kets pa<br>SPD (48<br>sPD (48<br>sectra.<br>ht on 1<br>po<br>sectra.<br>ht on 1<br>sectra.<br>b<br>o<br>o<br>n mat<br>stribut | S, & SER<br>s, we see the second | lants with<br>ly; connec<br>and quant<br>vALUE) | Helixor a<br>tions, air<br>ity ordere<br>DPERATI<br>RAMOE:<br>Unlimited<br>Heat trar<br>Canabilit | NG<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Stern<br>Ste | for or or other or other or other or other | air 1in<br>2. Aerator<br>install<br>OPERATION<br>1. Oberati<br>content<br>2. Mainten<br>checkin<br>STANDARD<br>BUDES MET<br>Patented<br>Datented<br>1. With an                                                               | PERFORM<br>a trongstreense<br>processing the second<br>and second the second second<br>processing the second second<br>processing the second second<br>second second second second second<br>processing the second second second second<br>second second second second second second second<br>second second second second second second second second<br>second second s | wer source m<br>d down.<br>e anchored dd<br>y engineer.<br>NANCE REQU<br>er, calculat<br>necessary fr<br>i turbulence<br>m by operatir<br>Dy operatir<br>ANCE<br>Fr.             | own, fitted<br>UIREMENTS<br>ion of actua<br>or proper co<br>cleans aera<br>ng engineer n                                                              | and sized by<br>1 and desirec<br>ntrol.<br>tors, period:<br>necessary.                                                                   |                   |
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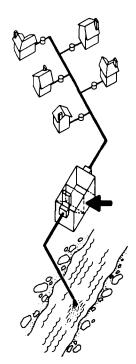


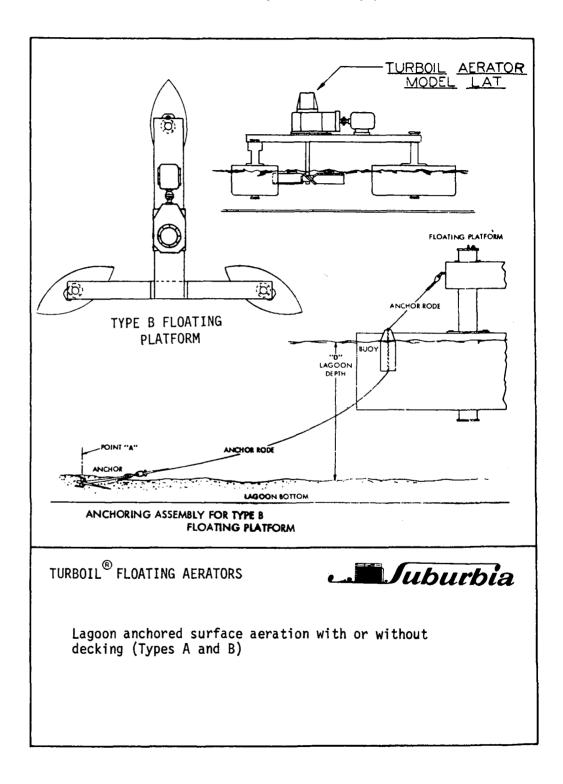
| CI                                                                                                                                      | NCINN.<br>13) 871                                                                                        | ATI, OH<br>2754                                                                                                       | EN AIF                                                                          | 226                                                                                                   | DMINIST                                                            | RATION                                                                                                      | LDG.                                                           |                                                                                                                                                                                                             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| 2. Two<br>por<br>3. Pro<br>ab                                                                                                           | I <b>ES</b><br>mpresse<br>o "figu<br>sitive<br>essure<br>le at e                                         | d air b<br>re 8" ]<br>movemen<br>and vac<br>xtra co                                                                   | lower<br>obed i<br>t of a<br>uum re                                             | acts as<br>mpellers<br>ir @ 3-6<br>lief val                                                           | ves and mu                                                         | el shafts<br>uffler fil                                                                                     | ; cause<br>ters avai                                           |                                                                                                                                                                                                                                   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                                                                   | sucked in by<br>ate in oppo<br>chamber.<br>over-press                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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| 5. Oni                                                                                                                                  | e piece<br>lash lu                                                                                       | casing<br>bricate                                                                                                     | d, lip                                                                          | ight too                                                                                              | otor requ<br>BPH.<br>Ith spur ge<br>Irbon shaft                    | ears, timi                                                                                                  | ng gears                                                       |                                                                                                                                                                                                                  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| NODEL<br>NUMBER                                                                                                                         | · · · ·                                                                                                  | MENSK                                                                                                                 | <u>, '</u>                                                                      | WEIGH                                                                                                 | CAPACITY                                                           | TANK<br>CAPACITY                                                                                            | SUGG. LIST                                                     | INSTALL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| (MAJOR)                                                                                                                                 | LENGTH                                                                                                   |                                                                                                                       |                                                                                 |                                                                                                       | (GPD)                                                              | (GAL.)                                                                                                      | (FOB<br>FACTORY)                                               | COST                                                                                                                                                                                                        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| SIZING<br>1. Pui<br>ari<br>2. 7 a<br>pre<br>COSTS                                                                                       | 1<br>B GRO<br>1 ley, si<br>angeme<br>bain s<br>ssure                                                     | WTH PO<br>heave,<br>nts can<br>izes, a<br>can be                                                                      | Coupli<br>be ad<br>vailab<br>regula                                             | IAL<br>ng, dire<br>lapted to<br>le at 3<br>ted by π                                                   | (not moto<br>motor and<br>RPN rating<br>lotor size                 | tion, or W<br>blower.<br>Is each, w<br>and RPM.                                                             | olume and                                                      | ve i<br>i<br>OP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1. Blower<br>(30-50<br>2. Electri<br>in sand<br>ERATION                                                                                                        | SAE depend<br>cal and pi<br>y locales,<br>& MAINTE                                                                                                                                                                             | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE REOL                                                                                                      | nt temperatu<br>required, f<br>eeded, inle<br>JIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                     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| SIZING<br>1. Pui<br>ari<br>2. 7 a<br>pre<br>COSTS                                                                                       | 1 <sub>B</sub><br>B GRO<br>Hey, si<br>angeme<br>hain s<br>ssure o<br>st info                             | <b>VTH PC</b><br>heave,<br>nts can<br>izes, a<br>can be<br>rmation                                                    | TENTI<br>coupli<br>be ad<br>vailab<br>regula<br>avail                           | IAL<br>ng, dire<br>apted to<br>le at 3<br>ted by m<br>able fro                                        | nct connect<br>motor and<br>RPN rating<br>otor size<br>m manufact  | tion, or W<br>blower.<br>Is each, w<br>and RPM.                                                             | olume and                                                      | ve i<br>r. OP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ol> <li>Blower<br/>(30-50</li> <li>Electri<br/>in sand</li> <li>ERATION</li> <li>Regular</li> <li>Oiling<br/>ments s</li> <li>If unit</li> </ol>              | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br>maintenan<br>and checki<br>hould be m<br>is shut d                                                                                              | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne                                                                                                                    | nt temperatu<br>required, f<br>eeded, inlet<br>JIREMENTS<br>ation recom<br>can be done<br>nsulting fau<br>B hours, it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ure, PSI, et<br>ilter-muffle<br>t screen rec<br>mended.<br>by operator<br>ctory.<br>should be f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |
| SIZING<br>1. Pui<br>ari<br>2. 7 s<br>pre<br>COSTS<br>1. Cos<br>MODEL<br>NUMBER                                                          | 1 <sub>B</sub><br>B GROA<br>Iley, si<br>angeme<br>asin s<br>ssure of<br>st info                          | WTH PO<br>heave,<br>nts can<br>izes, a<br>can be<br>rmation                                                           | TENTI<br>coupli<br>be ad<br>vailab<br>regula<br>avail<br>avail                  | IAL<br>ng, dire<br>lapted to<br>le at 3<br>ted by m<br>able fro<br>ANCE-OUT                           | nct connect<br>motor and<br>RPN rating<br>Notor size<br>m manufact | tion, or V<br>tolower.<br>seach, v<br>and RPM.<br>turer or c<br>OPERATII<br>RANGES                          | olume and<br>listributo                                        | ve 0P<br>r. 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ol> <li>Blower<br/>(30-50)</li> <li>Electri<br/>in sand</li> <li>ERATION</li> <li>Regular</li> <li>Oiling<br/>ments s</li> <li>If unit<br/>with oi</li> </ol> | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br>maintenan<br>and checki<br>hould be m<br>is shut d<br>l and kero                                                                                | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE RECU<br>ce and inspec<br>ng for wear co<br>ade after cor<br>own for 24-48                                 | nt temperatu<br>required, f<br>eeded, inlet<br>JIREMENTS<br>ation recom<br>can be done<br>nsulting fau<br>B hours, it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ure, PSI, et<br>ilter-muffle<br>t screen rec<br>mended.<br>by operator<br>ctory.<br>should be f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | to<br>er |
| SIZING<br>1. Pu<br>ari<br>2. 7 s<br>pre<br>COSTS<br>1. Co:<br>MODEL                                                                     | 1<br>B GROO<br>11ey, si<br>angeme<br>bain s<br>sssure o<br>st info<br>rtch                               | WTH PC<br>heave,<br>nts can<br>izes, a<br>can be<br>rmation                                                           | TENTI<br>coupli<br>be ad<br>vailab<br>regula<br>avail<br>avail                  | IAL<br>ng, dire<br>lapted to<br>le at 3<br>ted by m<br>able fro                                       | nct connect<br>motor and<br>RPN rating<br>Notor size<br>m manufact | ion, or V<br>I blower.<br>Is each, v<br>and RPM.<br>Curer or c<br>OPERATH<br>RANGES<br>(TEMP, OTh<br>Air at | NG NG<br>SG Noi                                                | CURE<br>BOORS<br>Se. 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ol> <li>Blower<br/>(30-50)</li> <li>Electri<br/>in sand</li> <li>ERATION</li> <li>Regular</li> <li>Oiling<br/>ments s</li> <li>If unit<br/>with oi</li> </ol> | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br>maintenan<br>and checki<br>hould be m<br>is shut d<br>l and kero                                                                                | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE RECU<br>ce and inspec<br>ng for wear co<br>ade after cor<br>own for 24-48                                 | nt temperatu<br>required, f<br>eeded, inlet<br>JIREMENTS<br>ation recom<br>can be done<br>nsulting fau<br>B hours, it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ure, PSI, et<br>ilter-muffle<br>t screen rec<br>mended.<br>by operator<br>ctory.<br>should be f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | to<br>er |
| SIZING<br>1. Pui<br>ari<br>2. 7 a<br>pro<br>COSTS<br>1. Cost<br>MODEL<br>MUMBER<br>(MAJOR)                                              | 1<br>B GRON<br>lley, sl<br>angeme<br>asin s<br>sssure o<br>st info<br>rtcc.<br>(R = 1                    | WTH PO<br>heave,<br>nts can<br>izes, a<br>can be<br>rmation<br>mation                                                 | TENTI<br>coupli<br>be ad<br>vailab<br>regula<br>avail<br>avail                  | IAL<br>ng, dire<br>apted to<br>le at 3<br>ted by m<br>able fro<br>ANCE-OUT<br>- ACTUAL 1<br>COO       | nct connect<br>motor and<br>RPN rating<br>Notor size<br>m manufact | Correction of V<br>blower.<br>Is each, w<br>and RPM.<br>Curer or c<br>Correction<br>RANGES<br>(TEMP, OT)    | NG NG<br>SG Noi                                                | r. OP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ol> <li>Blower<br/>(30-50)</li> <li>Electri<br/>in sand</li> <li>ERATION</li> <li>Regular</li> <li>Oiling<br/>ments s</li> <li>If unit<br/>with oi</li> </ol> | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br>maintenan<br>and checki<br>hould be m<br>is shut d<br>l and kero                                                                                | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE RECU<br>ce and inspec<br>ng for wear co<br>ade after cor<br>own for 24-48                                 | nt temperatu<br>required, f<br>eeded, inlet<br>JIREMENTS<br>ation recom<br>can be done<br>nsulting fau<br>B hours, it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ure, PSI, et<br>ilter-muffle<br>t screen rec<br>mended.<br>by operator<br>ctory.<br>should be f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | to<br>er |
| SIZING<br>1. Pui<br>ari<br>2. 7 a<br>pro<br>COSTS<br>1. Cost<br>MODEL<br>MUMBER<br>(MAJOR)                                              | 1<br>B GRON<br>lley, sl<br>angeme<br>asin s<br>sssure o<br>st info<br>rtcc.<br>(R = 1                    | WTH PO<br>heave,<br>nts can<br>izes, a<br>can be<br>rmation<br>mation                                                 | TENTI<br>coupli<br>be ad<br>vailab<br>regula<br>avail<br>avail                  | IAL<br>ng, dire<br>apted to<br>le at 3<br>ted by m<br>able fro<br>ANCE-OUT<br>- ACTUAL 1<br>COO       | nct connect<br>motor and<br>RPN rating<br>Notor size<br>m manufact | ion, or V<br>I blower.<br>Is each, v<br>and RPM.<br>Curer or c<br>OPERATH<br>RANGES<br>(TEMP, OTh<br>Air at | NG NG<br>SG Noi                                                | CURE<br>BOORS<br>Se. 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ol> <li>Blower<br/>(30-50)</li> <li>Electri<br/>in sand</li> <li>ERATION</li> <li>Regular</li> <li>Oiling<br/>ments s</li> <li>If unit<br/>with oi</li> </ol> | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br>maintenan<br>and checki<br>hould be m<br>is shut d<br>l and kero                                                                                | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE RECU<br>ce and inspec<br>ng for wear co<br>ade after cor<br>own for 24-48                                 | nt temperatu<br>required, f<br>eeded, inlet<br>JIREMENTS<br>ation recom<br>can be done<br>nsulting fau<br>B hours, it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ure, PSI, et<br>ilter-muffle<br>t screen rec<br>mended.<br>by operator<br>ctory.<br>should be f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |
| SIZING<br>1. Pui<br>ari<br>2. 7 a<br>pro<br>COSTS<br>1. Cost<br>MODEL<br>MUMBER<br>(MAJOR)                                              | 1<br>B GRON<br>lley, sl<br>angeme<br>asin s<br>sssure o<br>st info<br>rtcc.<br>(R = 1                    | WTH PO<br>heave,<br>nts can<br>izes, a<br>can be<br>rmation<br>mation                                                 | TENTI<br>coupli<br>be ad<br>vailab<br>regula<br>avail<br>avail                  | IAL<br>ng, dire<br>apted to<br>le at 3<br>ted by m<br>able fro<br>ANCE-OUT<br>- ACTUAL 1<br>COO       | nct connect<br>motor and<br>RPN rating<br>Notor size<br>m manufact | ion, or V<br>I blower.<br>Is each, v<br>and RPM.<br>Curer or c<br>OPERATH<br>RANGES<br>(TEMP, OTh<br>Air at | NG NG<br>SG Noi                                                | CURE<br>BOORS<br>Se. 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ol> <li>Blower<br/>(30-50)</li> <li>Electri<br/>in sand</li> <li>ERATION</li> <li>Regular</li> <li>Oiling<br/>ments s</li> <li>If unit<br/>with oi</li> </ol> | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br>maintenan<br>and checki<br>hould be m<br>is shut d<br>l and kero                                                                                | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE RECU<br>ce and inspec<br>ng for wear co<br>ade after cor<br>own for 24-48                                 | nt temperatu<br>required, f<br>eeded, inlet<br>JIREMENTS<br>ation recom<br>can be done<br>nsulting fau<br>B hours, it                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ure, PSI, et<br>ilter-muffle<br>t screen rec<br>mended.<br>by operator<br>ctory.<br>should be f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |
| SIZING<br>1. Pui<br>ari<br>2. 7 a<br>pro<br>COSTS<br>1. Cost<br>MODEL<br>MUMBER<br>(MAJOR)                                              | 1<br>B GRON<br>lley, sl<br>angeme<br>asin s<br>sssure o<br>st info<br>rtcc.<br>(R = 1                    | WTH PO<br>heave,<br>nts can<br>izes, a<br>can be<br>rmation<br>mation                                                 | TENTI<br>coupli<br>be ad<br>vailab<br>regula<br>avail<br>avail                  | IAL<br>ng, dire<br>apted to<br>le at 3<br>ted by m<br>able fro<br>ANCE-OUT<br>- ACTUAL 1<br>COO       | nct connect<br>motor and<br>RPN rating<br>Notor size<br>m manufact | ion, or V<br>I blower.<br>Is each, v<br>and RPM.<br>Curer or c<br>OPERATH<br>RANGES<br>(TEMP, OTh<br>Air at | olume and<br>listributo<br>sean o<br>SG Noi<br>O No            | ve<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CORE<br>CO | <ol> <li>Blower<br/>(30-50)</li> <li>Electri<br/>in sand</li> <li>Regular</li> <li>Regular</li> <li>Oiling<br/>ments s</li> <li>If unit<br/>with oi</li> </ol> | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br><b>maintenan</b><br>and checki<br>hould be m<br>is shut d<br>l and kero                                                                         | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE RECU<br>ce and inspec<br>ng for wear co<br>ade after cor<br>own for 24-48                                 | nt temperating<br>required, f<br>reded, inlet<br>unterpresent<br>schon recom-<br>schon recom-<br>scho | Jre, PSI, et al.<br>Iter-mufflater<br>inter-mufflater<br>by operator<br>ctory.<br>should be f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | to<br>er |
| SIZING<br>1. Pu<br>ari<br>2. 7 a<br>pre<br>COSTS<br>1. Cos<br>MODEL<br>NUMBER<br>(MAADEL<br>All1<br>WARRA<br>1. 1 j<br>2. All<br>3. Hol | IB GROO<br>Iley, si angeme<br>angeme<br>sissure (R = 1<br>GOO<br>NA<br>NTIES,<br>rear wa<br>Jabor or uni | VTH PO<br>heave,<br>its can a<br>can be<br>mmation<br>RECALP<br>REDUCT<br>SUARA<br>SUARA<br>rranty<br>paid f<br>guara | TENTI<br>coupli<br>be add<br>regula<br>availa<br>availa<br>NA<br>NA<br>NA<br>NA | Ance-our<br>Ance-our<br>Ance-our<br>Actual<br>COO<br>NA<br>S, & SER<br>kmanship<br>owner.<br>separate | ct connect<br>motor and<br>RPM rating<br>otor size<br>m manufact   | COPERATI<br>RANGE<br>COPERATI<br>RANGE<br>CITEME.OF<br>Air at<br>of 1.                                      | olume and<br>listributo<br>se no<br>SG Noi<br>2No<br>anufactur | r. OP<br>r. OP<br>se. 2<br>odors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Blower     (30-50     Zeteri     in sand     ERATION     Regular     Colling     ments     sand     standard     codesmer                                      | may be ins<br>SAE depend<br>cal and pi<br>y locales,<br><b>&amp; MAINTE</b><br><b>maintenan</b><br>and checki<br>hould be m<br>is shut d<br>l and kero<br>rials (muf<br><b>PERFORM</b><br>based on<br>rating rel<br>onstant vo | talled outsic<br>ing on ambier<br>ping skills r<br>firm base ne<br>NANCE RECA<br>ce and inspec<br>ce and inspec<br>ade after co<br>own for 24-48<br>sene to preve<br>sene to preve | nt temperatin<br>required, f<br>heded, inlet<br>JIREMENTS<br>tion recom-<br>an be done<br>nsulting fa<br>B hours, it<br>ent rusting<br>tent rusting<br>ters, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <pre>rre.pSI.etiliter-mufi</pre> |          |





|                           | ~                                                                                                                                                                                                                                                            |            | u ripu                     | MI, VILE                | President |                               |                  |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                  | HYC                                                                   | RO-CHEK A                  | AR DIFFUSE                                                                     |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------|-------------------------|-----------|-------------------------------|------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------|
| dia<br>2. Nor             | Plastic Ewo part diffuser: (1) disc plate, (2) neoprene<br>diaphragm.<br>Non-Clog diaphragm closes orifices upon loss of pressure.<br>Non-Clog diaphragm closes orifices discharge air downward.<br>Ten 0.125 inch diameter orifices discharge air downward. |            |                            |                         |           |                               |                  |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | orifices.<br>ng outside<br>nd increase<br>aller bubbl<br>r stops, d <sup>o</sup> | of diffuser,<br>e oxygen tran<br>les.<br>iaphragm is f<br>disc plate, | air bubble<br>sfer efficie | gm and flows<br>s hit diffuse<br>ency by shear<br>tside pressur<br>backflow of |
|                           |                                                                                                                                                                                                                                                              |            |                            |                         |           |                               |                  |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | · · · · ·                                                                        |                                                                       |                            |                                                                                |
| MODEL<br>NUMBER           | <u> </u>                                                                                                                                                                                                                                                     | 1          |                            | 1                       | CAPACITY  | CAPACITY                      | SUGO, LIST       | INSTAL                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | DESIGN<br>LIFETIME                                                               | ELECTRICITY                                                           |                            |                                                                                |
| (MAJOR)                   | LENGTI                                                                                                                                                                                                                                                       | WIDTH      | HEIGHT                     |                         | (GPD)     | (GAL.)                        | (FOB<br>FACTORY) | C087                              | CO87                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (YRS.)                                                                           | (RATING)                                                              |                            |                                                                                |
|                           |                                                                                                                                                                                                                                                              |            |                            |                         |           |                               |                  |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                  |                                                                       |                            |                                                                                |
| <u> </u>                  | <u> </u>                                                                                                                                                                                                                                                     |            |                            |                         |           | <u> </u>                      |                  |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                  |                                                                       |                            |                                                                                |
| SIZING                    | ∎ Gro                                                                                                                                                                                                                                                        | ALU POI    |                            | -                       |           |                               |                  | 0                                 | recomment<br>PERATION<br>1. Turbuler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ofpe-fittir<br>nded.<br>& MAINTE                                                 | ng diffuser h<br>NANCE REQU<br>air on diaph                           | JIREMENTS                  | -                                                                              |
| COSTS                     | TECH                                                                                                                                                                                                                                                         | INICAL PEI | FORMA                      | NCE-OUTP                |           | OPERATI                       |                  | 0                                 | <ol> <li>Simple p<br/>recomment<br/>PERATION</li> <li>Turbulet</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ofpe-fittir<br>ded.<br>& MAINTE<br>at flow of<br>p, no maint                     | ng diffuser h<br>NANCE REQU<br>air on diaph                           | JIREMENTS                  | -                                                                              |
| COSTS                     | TECH                                                                                                                                                                                                                                                         | INICAL PER | FORMAI<br>DN, A = /        | NCE-OUTP                |           | OPERATI<br>RANGE<br>(TEMP, OT | 6                | 0                                 | <ol> <li>Simple 1<br/>recomment<br/>PERATION</li> <li>Turbulet<br/>build-up</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | bipe-fittir<br>Med.<br>& MAINTE<br>at flow of<br>p, no maint                     | ng diffuser h<br>NANCE REQU<br>air on diaph                           | JIREMENTS                  | -                                                                              |
| MODEL                     | TEC:<br>(A •                                                                                                                                                                                                                                                 | INICAL PEI | FORMAI<br>DN, A = /        | NCE-OUTPI               |           | RANGE                         | 6                | 0                                 | <ol> <li>Simple ;<br/>recomment</li> <li>PERATION</li> <li>Turbuler</li> <li>build-u;</li> <li>STANDARD:</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | bipe-fittir<br>Med.<br>& MAINTE<br>at flow of<br>p, no maint                     | ng diffuser h<br>NANCE REQU<br>air on diaph                           | JIREMENTS                  | -                                                                              |
| COSTS<br>MODEL<br>NUMBER  | TEC:<br>(A •                                                                                                                                                                                                                                                 | INICAL PEI | FORMAI<br>DN, A = /        | NCE-OUTPI               |           | RANGE                         | 6                | 0                                 | <ol> <li>Simple ;<br/>recomment</li> <li>PERATION</li> <li>Turbuler</li> <li>build-u;</li> <li>STANDARD:</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | bipe-fittir<br>Med.<br>& MAINTE<br>at flow of<br>p, no maint                     | ng diffuser h<br>NANCE REQU<br>air on diaph                           | JIREMENTS                  | -                                                                              |
| COSTS<br>MODEL<br>NUMBER  | TEC:<br>(A •                                                                                                                                                                                                                                                 | INICAL PEI | FORMAI<br>DN, A = /        | NCE-OUTPI               |           | RANGE                         | 6                | 0                                 | <ol> <li>Simple ;<br/>recomment</li> <li>PERATION</li> <li>Turbuler</li> <li>build-u;</li> <li>STANDARD:</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | bipe-fittir<br>Med.<br>& MAINTE<br>at flow of<br>p, no maint                     | ng diffuser h<br>NANCE REQU<br>air on diaph                           | JIREMENTS                  | -                                                                              |
| MODEL<br>NUMBER<br>MAJORI | TECL<br>(R •<br>BOO <sub>5</sub>                                                                                                                                                                                                                             | INICAL PEI | FORMAL<br>34, A = 1<br>0 C | NCE-OUTPI<br>INCTUAL V. |           | RANGE                         | 6                | Orise<br>B<br>B<br>DORS<br>T<br>T | 1. Simple in recomment recomment for the second se | PERFORM.<br>Oxygen tra<br>for 2 to                                               | ng diffuser h<br>NANCE REQU<br>air on diaph<br>enance.                | JIREMENTS<br>ragm el imina | -                                                                              |





|                           | 37<br>P.<br>LE<br>(9<br>FEATUR<br>1. Por<br>aer<br>2. Tur<br>gea<br>3. Clo<br>cov<br>4. Two | 85 WE<br>0. BO<br>AWOC<br>13) 645<br>Attm<br>ES<br>itcon-t<br>ation;<br>boil a<br>ired sp<br>ised ce<br>vered w<br>o ponto<br>b ponto<br>b ponto | ype flow<br>four mi<br>erator w<br>eed redi<br>11 polyi<br>ith Hyse | SAS 66:<br>C. Sance<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chanica<br>chani | 206<br>by, Vice<br>rators<br>1 turbit<br>cor and<br>cor an | For lago<br>ines.<br>"hollow<br>d stainle<br>System C<br>System C | on<br>qu<br>ss<br>G-4 |
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For<br>4,0<br>COSTS                                                               | ating<br>LAT a<br>Turbo<br>100 to                                                                                                                | aerator<br>erators<br>11 aera<br>132,000                            | platfor<br>cors fro<br>GPM are                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| 37<br>P<br>Le                                                                            | 85 WE<br>O. BO)<br>AWO(<br>13) 649                                          | ST 951<br>X 6217<br>DD, KA<br>9-4994                                                                     | NSAS                                                                  | 66206                                                                                                                                            | President,                                                               | Sales                               |                                          | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                        |                                                                                                         |                                                              | BOIL®A                                       | ERATOR:                                                         | 5    |  |  |  |
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| aer<br>2. Tur<br>gea<br>3. Clo<br>cov<br>4. Two<br>Typ                                   | toon-t<br>ation;<br>boil a<br>red sp<br>sed ce<br>ered w<br>ponto<br>e B, w | four<br>erator<br>eed re<br>11 pol<br>nith Hy<br>on con<br>rithout                                       | mechan<br>with n<br>ducers.<br>yuretha<br>sol Epo                     | ical turb<br>notor and<br>ane-fille<br>oxy Resir<br>tions: Ty<br>Ng.                                                                             | for lagoo<br>ines.<br>"hollow o<br>d stainles<br>System CO<br>pe A, with | uill" sha<br>s steel p<br>-4227 and | aft mountin<br>contoons<br>1 HZ-3487.    | 19, 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | cables<br>Mechani<br>water f<br>of soli                                                | aerator f<br>to lagoon<br>cal mixer<br>or aerobic<br>ds.<br>tion of ae                                  | floor.<br>"stirs" wate<br>treatment a                        | r, adding di<br>nd liquid mo                 | ater, anchore<br>ssolved oxyge<br>tion for susp<br>tribution of | n to |  |  |  |
|                                                                                          | 1                                                                           | DIMENS                                                                                                   |                                                                       | -                                                                                                                                                | 1                                                                        | ,                                   | T                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                        |                                                                                                         |                                                              |                                              |                                                                 |      |  |  |  |
| MODEL<br>AJMBER<br>MAJORI                                                                | LENGTI                                                                      | 1                                                                                                        |                                                                       | WEIGH<br>(LB.)                                                                                                                                   | RATED<br>CAPACITY<br>(GPD)                                               | TANK<br>CAPACITY<br>(GAL.)          | SUGG, LIST<br>(FOB<br>FACTORY)           | INSTALL<br>COST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | OPERATE<br>COST                                                                        | DESIGN<br>LIFETIME<br>(YRS.)                                                                            | ELECTRICITY<br>(RATING)                                      |                                              | OPERATING<br>BUPPLIES                                           |      |  |  |  |
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| and<br>2. For<br>4,0                                                                     | LAT a<br>Turbo                                                              | aerato<br>erator<br>il aer                                                                               | s.<br>ators f                                                         | forms Typ                                                                                                                                        | e A and B<br>150 HP, p<br>ated.                                          |                                     |                                          | NR 1<br>2<br>of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | . No spec<br>. Anchor                                                                  | mooring ca                                                                                              | REMENTS<br>required be<br>bles and att<br>NANCE REQI         | ach electric                                 |                                                                 |      |  |  |  |
| and<br>2. For<br>4,0<br><b>OSTS</b>                                                      | LAT a<br>Turbo<br>00 to                                                     | aerato<br>erator<br>11 aer<br>132,00                                                                     | r plati<br>s.<br>ators f<br>O GPM a                                   | forms Typ<br>from 1 to<br>ire estim                                                                                                              | 150 HP, p                                                                | umping ca                           | pacities (                               | AR 1<br>2<br>of <b>OP</b> I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | . No spec<br>. Anchor<br>ERATION                                                       | ial skills<br>mooring ca                                                                                | required be<br>bles and att                                  | ach electric                                 |                                                                 |      |  |  |  |
| and<br>2. For<br>4,0<br>OSTS<br>1. Aux                                                   | LAT a<br>Turbo<br>00 to<br>iliary<br>TECI<br>(R-                            | aerato<br>erator<br>11 aer<br>132,00<br>legs                                                             | r platf<br>s.<br>ators f<br>0 GPM a<br>for lag                        | forms Typ<br>from 1 to<br>ire estim                                                                                                              | 150 HP, p<br>ated.<br>om support                                         | OPERATII<br>RANGES                  | ipacities (<br>ional extra               | AR 1<br>2<br>of OP<br>is. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | . No spec<br>Anchor I<br>ERATION<br>. Periodi                                          | fal skills<br>mooring ca<br>& MAINTE<br>c inspecti                                                      | required be<br>bles and att                                  | ach electric                                 |                                                                 |      |  |  |  |
| and<br>2. For<br>4,0<br>OSTS<br>1. Aux                                                   | LAT a<br>Turbo<br>00 to<br>iliary                                           | aerato<br>erator<br>11 aer<br>132,00<br>legs                                                             | r platf<br>s.<br>ators f<br>0 GPM a<br>for lag                        | forms Typ<br>from 1 to<br>ure estim<br>goon bott                                                                                                 | 150 HP, p<br>ated.<br>om support                                         | oumping ca<br>; are opti            | ipacities (<br>ional extra               | AR 1<br>2<br>of <b>OP</b> I<br>is. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | . No spec<br>. Anchor :<br>ERATION<br>. Periodi                                        | fal skills<br>mooring ca<br>& MAINTE<br>c inspecti                                                      | required be<br>bles and att                                  | ach electric                                 |                                                                 |      |  |  |  |
| and<br>2. For<br>4,0<br>OSTS<br>1. Aux                                                   | LAT a<br>Turbo<br>00 to<br>iliary<br>TECI<br>(R-                            | aerato<br>erator<br>11 aer<br>132,00<br>legs                                                             | r plati<br>s.<br>ators f<br>O GPM a<br>for lag<br>PERFORM<br>CTION, A | Forms Typ<br>From 1 to<br>ure estim<br>poon bott                                                                                                 | 150 HP, p<br>ated.<br>om support                                         | OPERATII<br>RANGES                  | ipacities (<br>ional extra               | AR 1<br>2<br>of OP<br>is. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | . No spec<br>Anchor I<br>ERATION<br>. Periodi                                          | fal skills<br>mooring ca<br>& MAINTE<br>c inspecti                                                      | required be<br>bles and att                                  | ach electric                                 |                                                                 |      |  |  |  |
| and<br>2. For<br>4,0<br>OSTS<br>1. Aux                                                   | LAT a<br>Turbo<br>00 to<br>iliary<br>TECI<br>(R-                            | aerato<br>erator<br>11 aer<br>132,00<br>legs                                                             | r plati<br>s.<br>ators f<br>O GPM a<br>for lag<br>PERFORM<br>CTION, A | Forms Typ<br>From 1 to<br>ure estim<br>poon bott                                                                                                 | 150 HP, p<br>ated.<br>om support                                         | OPERATII<br>RANGES                  | ipacities (<br>ional extra               | AR 1<br>2<br>of OP<br>is. 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | . No spec<br>Anchor I<br>ERATION<br>. Periodi                                          | fal skills<br>mooring ca<br>& MAINTE<br>c inspecti                                                      | required be<br>bles and att                                  | ach electric                                 |                                                                 |      |  |  |  |
| and<br>2. For<br>4.0<br>OSTS<br>1. Aux<br>MODEL<br>UMBER<br>MARRAN<br>1. 1 yu<br>2. Perr | LAT at<br>Turboo<br>00 to<br>illiary<br>RCC<br>RCC<br>800s                  | aera to reator<br>erator<br>11 aer<br>132,00<br>1 legs<br>181CAL P<br>% REDUC<br>ST                      | r plati<br>s. ators 1<br>0 GPM a<br>for lag                           | Forms Typ<br>From 1 to<br>From 1 to<br>spoon bott<br>- ACTUAL<br>- ACTUAL<br>- ACTUAL<br>- ACTUAL<br>- ACTUAL<br>- S.& SERN<br>- ACTUAL<br>- COO | 150 HP, p<br>ated.<br>om support                                         | OPERATI<br>RANGES<br>(TEMP, OT)     | NG NG NG NG NG NG NG NG NG NG NG NG NG N | IR 1<br>of 2<br>of 0PI<br>is. 0PI<br>DHE<br>Solution                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | . No spec<br>. Anchor :<br>ERATION<br>. Periodi<br>STANDARDI<br>CODES MET<br>CODES MET | tal skills<br>mooring ca<br>& MAINTE<br>c inspecti<br>PERFORM.<br>d oxygen t<br>d oxygen t              | required be<br>bles and att<br>NANCE REQU<br>on, oil char    | ach electric.<br>UIREMENTS<br>ge.            | 4 1b 02/HP ho<br>employed.                                      |      |  |  |  |
| and<br>2. For<br>4.0<br>OSTS<br>1. Aux<br>HODEL<br>UMBER<br>MAJORI<br>ARRAN<br>1. 1 yu   | LAT at<br>Turboo<br>00 to<br>illiary<br>RCC<br>RCC<br>800s                  | aera to<br>era tor<br>11 aer<br>132,00<br>legs<br>skical f<br>% REDUC<br>St<br>GUAR/<br>rranty<br>ce gua | r plati<br>s. ators 1<br>0 GPM a<br>for lag                           | Forms Typ<br>From 1 to<br>From 1 to<br>spoon bott<br>- ACTUAL<br>- ACTUAL<br>- ACTUAL<br>- ACTUAL<br>- ACTUAL<br>- S.& SERN<br>- ACTUAL<br>- COO | 150 HP, p<br>ated.<br>om support<br>/ALUEI                               | OPERATI<br>RANGES<br>(TEMP, OT)     | NG NG NG NG NG NG NG NG NG NG NG NG NG N | IR 1<br>pr 2<br>pr  . No spec<br>. Anchor I<br>ERATION<br>. Periodi<br>standardo<br>cooss mer              | tal skills<br>mooring ca<br>& MAINTE<br>c inspection<br>PERFORM<br>d oxygen t<br>dava appl<br>drive rat | ANCE<br>ANCE<br>ANCE<br>ANCE<br>ANCE<br>ANCE<br>ANCE<br>ANCE | ciency of 3-<br>to process (<br>with AGMA 4) | 4 lb 02/HP ho<br>employed.<br>30.03.                            |      |  |  |  |

#### **Disinfection Devices** Introduction

Advance Chlorinators-Mounted, In-Line Chlorinators, 264 Capital Control Co. Sanuril-Pellet Feed Chlorinator, 266 Diamond Shamrock Corporation F & P Chlorinators-Mounted, In-Line Chlorinators, 268 Fisher & Porter Co. Ozone Generators-Ozonators-Corona Generators, 270 W. R. Grace and Co. Honeywell Chlorinators-Mounted, In-Line Chlorinators, 272 Honeywell Industrial Division Ultra-Dynamics Purifiers—Ultra-Violet Disinfection Unit, 274 Ultra-Dynamics Corporation

Even with properly operating equipment, present standards and practices for water treatment do not assure complete disinfection.\* When disinfection devices are improperly adjusted or when they are subject to malfunctions, the likelihood of their passing disease-causing organisms on to the receiving medium increases significantly.

The development of effective and highly reliable disinfection units is of great priority.

A variety of disinfection devices which can be used for disinfecting wastewater are described in this section. The most widely used method of disinfection is chlorination. Chlorine can be introduced in the gaseous state, as a solution of hypochlorite (house-hold bleach, for example), and as solid hypochlorite or other chemical compounds of chlorine. Whatever the form of introduction, the approach is to provide enough chlorine so that all organisms and substances that combine with chlorine will combine completely. An indication of the presumed sufficiency of the chlorination is a residual of free chlorine.

Chlorination takes time to kill organisms. Systems are designed such that the product of residual chlorine concentration and the chlorine-effluent contact time will equal a designated value which depends on the temperature and pH (alkalinity or acidity) of the water. Several chlorinators are described in this section.

Ozone,  $O_{3}$ , is a powerful agent for disinfection. Ozone can be created from oxygen gas by passing air through an electric discharge or through intense ultraviolet radiation of proper wavelengths. Ozone rich air is bubbled through the effluent, and as in the case of chlorine, it disinfects by oxidizing vital organic compounds which are constituents of microorganisms.

Ultraviolet radiation as well as ionizing radiation from other sources such as radioactive isotopes can be used to kill microorganisms. The ionizing radiation breaks apart key molecules which contain the basic information the cell needs in order to function. The completeness of kill depends on the wavelength and the intensity and duration of the radiation, as well as the amount of material (glass, water, for example) it must penetrate. Ionizing radiation units have been developed for municipal plants, but they are not generally available for small rural systems.

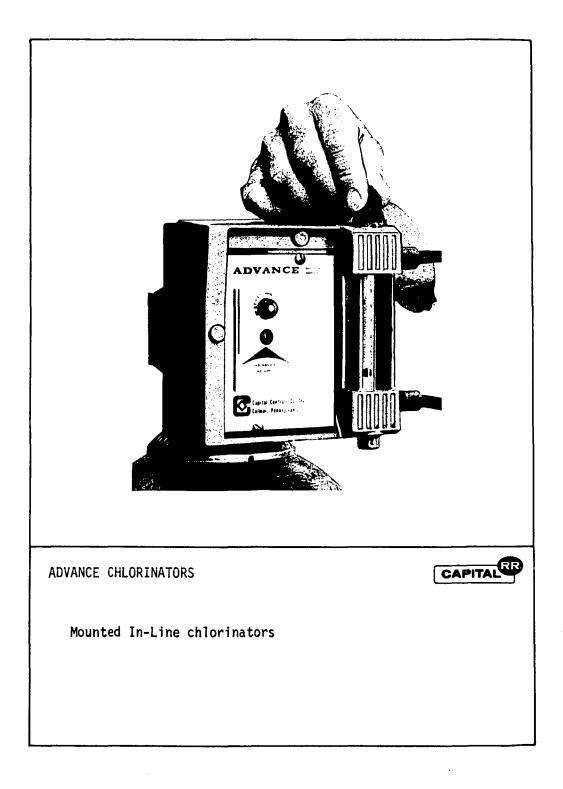
Pasteurization, or the killing of microorganisms contained in a liquid medium with prolonged application of heat, is another method of disinfection which may be especially

<sup>\*</sup>The Washington Post reported contaminated drinking water in two Massachusetts cities with drinkingwater treatment systems which "are not merely 'good' but of higher quality than those used for 'most of our waters' in the United States." [38] The water supplies of the two cities were found to contain viruses that cause disease in man. The discovery was said to be the first of its kind for properly treated water in the U.S.—previously discovered viruses in treated water supplies had been traced to malfunctions in treatment procedures.

## **Disinfection Devices**

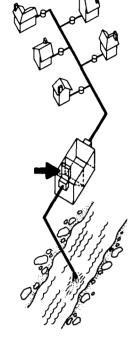
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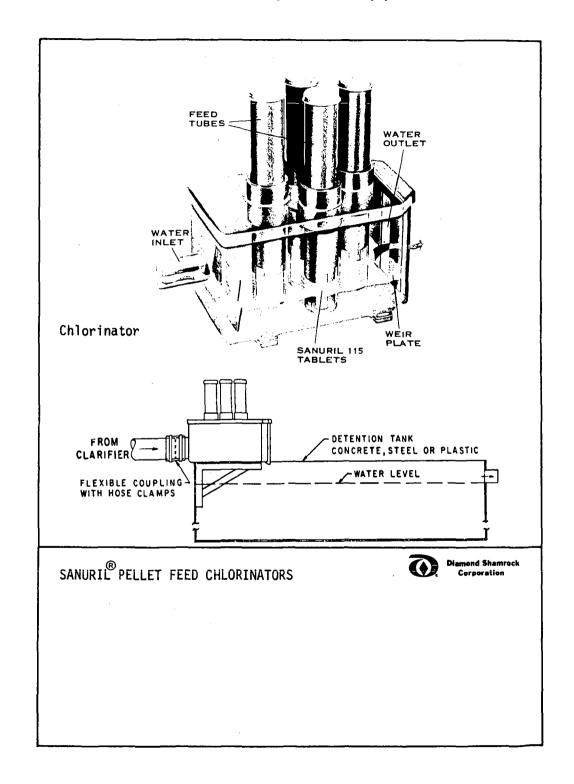
applicable to on-site treatment plants. By efficient design, energy can be transferred from the pasteurized treated effluent to the influent or to the mixed liquor through the use of heat exchangers. The resultant rise in temperature will generally speed up the processing of the sewage. One manufacturer plans to make pasteurization units for small plants available in the near future.



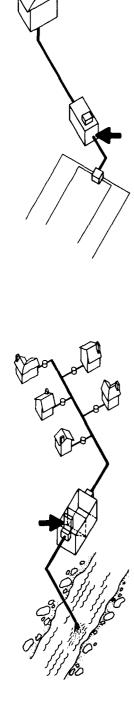
# **Disinfection Devices**

| MODEL                      |              |              |                                |                 |                |         |               |         | _              |         |                          | _ |                        |
|----------------------------|--------------|--------------|--------------------------------|-----------------|----------------|---------|---------------|---------|----------------|---------|--------------------------|---|------------------------|
| NUMBER                     |              | CIMENSIONS   |                                | WEIGHT<br>(LB.) | RATED          | TANK    | 5UGG. LIST    | INSTALL | <u> </u>       |         |                          |   |                        |
| (MAJOR)<br>Wall            | LENGTH       | <u> </u>     | HEIGHT                         |                 | (GPD)          | (GAL)   | (FOB          | COST    | See            | (¥ RBL) | (RATING)<br>None, unless |   | Chlorine,              |
| mounted                    |              | 3 "          | 6"                             | <u> </u>        | 0.3-100<br>ppm | NA      | 600 -<br>1000 |         | Costs<br>Below |         | booster<br>pump_needed   |   | water for<br>ejector.c |
| Ejector                    | 2 <u>1</u> " | 2 <u>1</u> " | 3"                             |                 |                |         |               |         |                |         |                          |   |                        |
|                            |              |              |                                |                 |                |         |               |         |                |         |                          |   |                        |
|                            | 1            | <u> </u>     |                                |                 |                |         |               | 1       | <u> </u>       |         |                          |   | t                      |
|                            |              |              |                                |                 |                | OPERATI | MG            | NONE    | STANDARD       |         |                          |   |                        |
| MODEL                      | TECH         |              | RFORMAN<br>10N, A = A          | CE-OUTP         | UT<br>ALUEI    |         |               |         |                |         |                          |   |                        |
| MODEL<br>NUMBER<br>(MAJOR) | (8 - 1       | REDUCT       | RFORMAN<br>10N, A = A<br>DO CC | CTUAL V         |                | RANGE   | •             | 20085   | CODES MET      |         |                          |   |                        |
| NUMBER                     | (8-1         | REDUCT       | 10N, A - A                     | CTUAL V         |                | RANGE   | •             | •       | CODES MET      |         |                          |   |                        |
| NUMBER                     | (8-1         | REDUCT       | 10N, A - A                     | CTUAL V         |                | RANGE   | •             | •       | CODES MET      |         |                          |   |                        |
| NUMBER                     | (8-1         | REDUCT       | 10N, A - A                     | CTUAL V         |                | RANGE   | •             | •       | CODES MET      |         |                          |   |                        |
| NUMBER                     | (8-1         | REDUCT       | 10N, A - A                     | CTUAL V         |                | RANGE   | •             | •       | CODESMET       |         |                          |   |                        |
| UNBER                      | (8-1         | REDUCT       | 10N, A - A                     | CTUAL V         |                | RANGE   | •             | •       | CODESMET       |         |                          |   |                        |



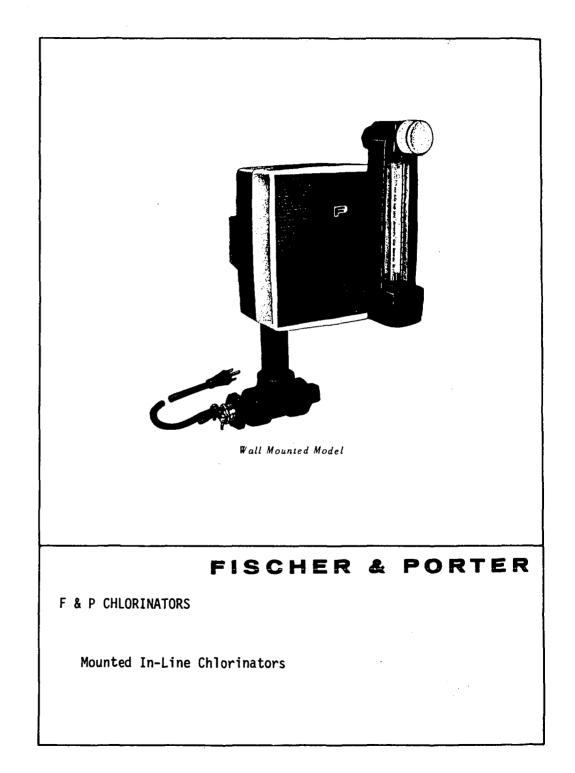


# **Disinfection Devices**



| T.  <br>P.  <br>PA                                  | R. EVA<br>D. BOX<br>INESVI<br>(6) 352-                                | NS RES<br>348<br>LLE, O<br>9311                          | EARCH                                   | 1 CENTI<br>077                              |                                                  | anuril Syst                                                                      | tems                                          |                         |                                                                                                       |                                     | PEL                                                                | SANU                                                                           |                              | R          |  |
|-----------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|---------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------|------------------------------|------------|--|
| ope<br>flo<br>2. Eac<br>whe<br>wat<br>3. "Ni<br>pac | r model<br>rate wi<br>ws.<br>h has t<br>re Sanu<br>er stre<br>ni-San" | thin th<br>ubes de<br>ril 115<br>am.<br>Model<br>ant; Mo | e range<br>scendin<br>tablet<br>200 for | e of ind<br>ng into<br>:s in tu<br>- home u | lividual  <br>flow-thro<br>bes slow<br>nit; Modu | erglass ch<br>home to 10<br>ough compa<br>ly disinte<br>el 100 for<br>milar) for | XO,000 GPD<br>ertment,<br>egrate int<br>small | s i                     | for chl<br>2. Sanuril<br>system                                                                       | orine-satu<br>System is             | ratior; more<br>placed on e<br>ct treated w                        | 115 tablets<br>flow, more t<br>ffluent flow<br>astewater wit                   | ablet exposu<br>line or with | ire.<br>in |  |
| MODEL                                               |                                                                       | MENSIO                                                   |                                         |                                             |                                                  | TANK                                                                             |                                               | STS (DOLLA              | ARE                                                                                                   |                                     | UTILITY REQUIREMENTS                                               |                                                                                |                              |            |  |
| NUMBER<br>(MAJOR)                                   | LENGTH                                                                | иатн                                                     | WEIGHT CAPACITY CAPACITY SUGG LIET      |                                             | INSTALL<br>CONST                                 | OPERATE<br>COST                                                                  | DESIGN<br>LIFETIME<br>(YRS.)                  | ELECTRICITY<br>(RATING) |                                                                                                       | OPERATING<br>SUPPLIES               |                                                                    |                                                                                |                              |            |  |
| Model<br>200                                        | 21"                                                                   | 8"                                                       | 10"                                     |                                             | Up to<br>1,500                                   | NA                                                                               | NA d                                          |                         |                                                                                                       | 10                                  | NA                                                                 |                                                                                | Sanurii<br>115<br>Tablets    |            |  |
| Model<br>100                                        | "                                                                     | ч                                                        | 9"                                      |                                             | Up to<br>10,000                                  | "                                                                                | 160.                                          | •                       | u                                                                                                     | •                                   | u                                                                  |                                                                                | •                            |            |  |
| Mode 1<br>1000                                      | 22"                                                                   | 13"                                                      | 12"                                     |                                             | 10,000-<br>50,000                                |                                                                                  | 285.                                          | •                       |                                                                                                       | n.                                  | •                                                                  |                                                                                | •                            |            |  |
| GPÖ<br>COSTS<br>1. Cos<br>2. Ave<br>ppm             | (Pric<br>t/unit<br>rage op<br>and 30<br>puril 11                      | es subj<br>is less<br>erating<br>) minute                | ect to<br>by lar<br>cost i<br>detent    | change<br>ger qua<br>is 2-4¢/<br>ion tim    | without m<br>intities.<br>1000 gal<br>Me,        | maximum i<br>notice.)<br>of water<br>ail or \$10                                 | 0.5-1.0                                       | OP                      | 2. 3 1/2"<br>6" PVC (<br>ERATION )<br>1. Monthly                                                      | on Model 1<br>& MAINTE<br>rechargin | 000.                                                               |                                                                                | s 100 and 20                 | ю;         |  |
| MODEL                                               |                                                                       |                                                          |                                         | CE-OUTPL                                    |                                                  | OPERATI                                                                          |                                               | 0156                    | STANDAROS                                                                                             |                                     |                                                                    |                                                                                |                              |            |  |
| MAJORI<br>Sanuril                                   | 800 <sub>6</sub>                                                      |                                                          | <b>PO</b> CO                            |                                             | Coli<br>(A)                                      | RANGEL<br>(TEMP, OTH                                                             | (ER) 0                                        | DORS                    | CODES MET                                                                                             |                                     | -,                                                                 |                                                                                |                              |            |  |
| 115<br>Jablets                                      |                                                                       |                                                          |                                         | 9                                           | 98.3 <sup>4</sup>                                | Unlimit<br>Exposur                                                               |                                               |                         | U.S.Patent                                                                                            | s                                   |                                                                    |                                                                                |                              |            |  |
|                                                     |                                                                       |                                                          |                                         |                                             | used on 3                                        | 500 GPD te                                                                       | sts.                                          |                         |                                                                                                       |                                     | - <u>.</u>                                                         |                                                                                |                              |            |  |
| WARRAN                                              | ITIES.G                                                               | UARAN                                                    | ITEES, 8                                |                                             | ۰.                                               |                                                                                  |                                               | co                      | <ol> <li>Sanuril<br/>70% Cl2<br/>3,445,3</li> <li>Under t</li> <li>MMENTS</li> <li>Units a</li> </ol> | content m<br>83.<br>esting by       | ts (3 1/8" d<br>inimum. U.<br>NSF, Ann Art<br>ACCUF<br>sewage trea | lia. x 13/16"<br>S. Patent No:<br>Nor, Michigan<br>NATE AS OF<br>Itment equipm | 3,165,521                    | and<br>72  |  |
|                                                     |                                                                       |                                                          |                                         |                                             |                                                  |                                                                                  |                                               |                         |                                                                                                       |                                     |                                                                    |                                                                                |                              |            |  |

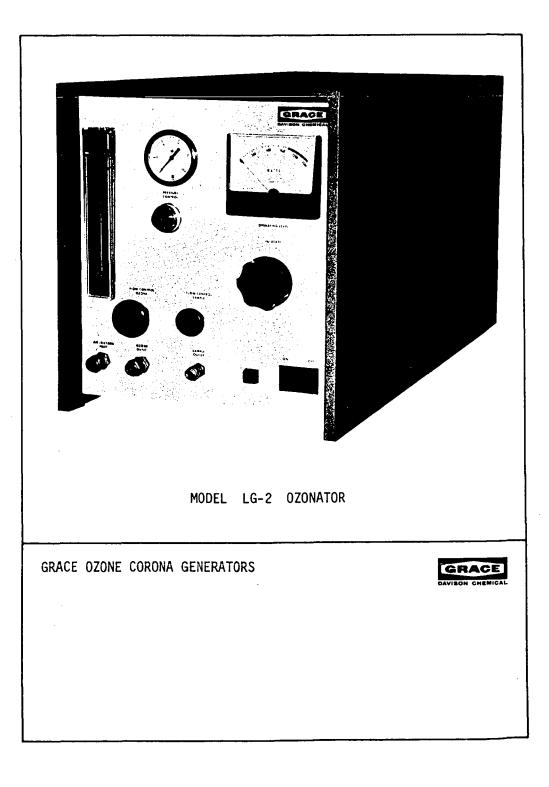
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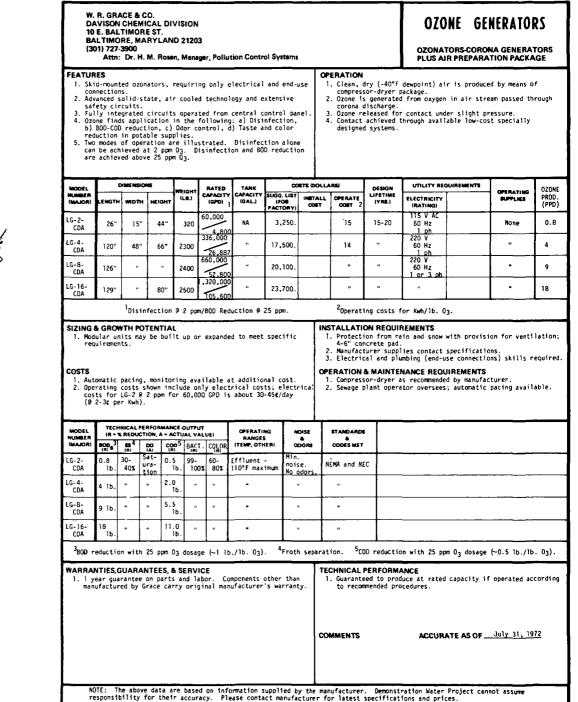


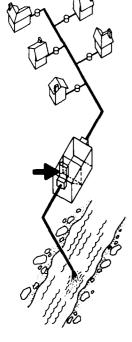
| W/                                                                     | ARMIN:<br>15) 675                                                                                   |                                                                                                     | PA. 1897                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                         |             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| reg<br>2. Reg<br>10s<br>3. Wal<br>4. Out<br>5. Rem                     | cum ope<br>gulator<br>gulator<br>st.<br>ll, cyl<br>t-of-gae<br>note eje                             | valve t<br>cuts of                                                                                  | box and<br>ff chlom<br>ton cont<br>ators.<br>ounting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | in-line<br>ine whe<br>ainer,<br>possibl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | and cabir<br>le.                                                                           | upply or                         | vacuum is<br>vacuum is<br>ed models. |                 | <ol> <li>Gas pas</li> <li>Water u<br/>vacuum</li> </ol>                                                    | e gas is o<br>ses throug<br>nder press<br>for drawig                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | frawn through o<br>gh rotameter a<br>sure passes th<br>ng gas into wa<br>n enters point | nd flow rai<br>rough injec<br>ter supply.          | te adjusting v<br>ctor creating       | alve.<br>a |
|                                                                        |                                                                                                     | HMENERO                                                                                             | Has 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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                                       |                                       | -          |
| MODEL<br>NUMBER<br>(MAJOR)                                             | LENGTH                                                                                              | WIDTH                                                                                               | некант                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | WEIGHT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | RATED<br>CAPACITY                                                                          | TANK<br>CAPACITY<br>(GAL)        | SUGG. LIST<br>(FOB<br>FACTORY)       | INSTALL<br>COST | · · · · · ·                                                                                                | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ELECTRICITY<br>(RATINO)                                                                 |                                                    |                                       |            |
| 70C<br>1710                                                            | 6 <u>3</u> "                                                                                        | 7 <del>_9</del> "                                                                                   | 8"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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                                                                                                                                                                                                                                                                                                                                                                                   | 1-500<br>PPD                                                                               | NA                               |                                      |                 | See<br>Costs<br>Below                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | None,unless<br>booster<br>pump_needed                                                   |                                                    | Chiorine,<br>water for<br>ejector,pum |            |
| 70C<br>1730                                                            |                                                                                                     | 10 <u>5</u> "                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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                                       |                                       |            |
| 70C<br>1750                                                            | 18"                                                                                                 | 10"                                                                                                 | 58"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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                                                                                                                                                                                                                                                                                                                                                                                   | 1-300<br>PPD                                                                               | ,                                |                                      |                 | "                                                                                                          |                                                                                                                                                                                                                                                                                                                                               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                                       |                                       |            |
| 2<br>Ejector                                                           | 11 <mark>7</mark> "                                                                                 | 3 <del>1</del> "                                                                                    | 8 <u>5</u> "                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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|                                                                        |                                                                                                     | as dispe<br>"ID hos                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | box; 171                                                                                   | 0 - Cyli                         | nder mount                           | ed, 1730        | - ton con                                                                                                  | tainer mou                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | unted, 1750 -                                                                           | cabinet mor                                        | del.                                  |            |
|                                                                        | zing is<br>PPD                                                                                      | determ                                                                                              | x .012 :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ppm des                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | sired:<br>esired<br>f effluen:<br>naximum ra                                               | L.<br>iting.                     |                                      |                 | wall in<br>2. Install                                                                                      | installed<br>line or<br>ation by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Cylinder moun<br>cabinet mounte<br>qualified pers<br>t of effluent)                     | d.<br>onnel: ne                                    | ed water for                          | njec       |
| on<br>2. Ope<br>COSTS<br>1. Ch<br>2. Boo                               | zing is<br>PPD<br>r l ppm<br>eration<br>lorine<br>out 6-9<br>oster p                                | determ<br>- GPM :<br>= 8.34<br>possib                                                               | ined by<br>x .012 :<br>lb./M (<br>le at l,<br>or ton o<br>n about                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ppm des<br>ppm des<br>pals. of<br>20 of m<br>t 15-17<br>containe<br>\$115 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | estred<br>feffluen<br>naximum ra<br>t/1b. for<br>ers.<br>\$500.                            | 150 15. 1                        |                                      | OP              | 1. Can be<br>wall in<br>2. Install<br>(can us<br>gas.<br>ERATION<br>1. No spec                             | installed<br>-line or a<br>ation by<br>e offshoo<br>& MAINTE<br>fal train                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cylinder moun<br>cabinet mounte<br>qualified pers                                       | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | nject      |
| 07<br>2. 0pt<br><b>COSTS</b><br>1. Ch <sup>1</sup><br>abo              | zing is<br>PPD<br>r l ppm<br>eration<br>lorine<br>out 6-9<br>oster p                                | determ<br>- GPM :<br>= 8,34<br>possib<br>costs ri<br>¢/lb. fi<br>umps rul<br>NHCAL PEL<br>s REDUCTI | ined by<br>x .012 :<br>lb./M (<br>le at l,<br>or ton o<br>n about                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ppm des<br>ppm des<br>pals. of<br>20 of m<br>t 15-17(<br>containe<br>\$115 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | estred<br>feffluen<br>naximum ra<br>t/1b. for<br>ers.<br>\$500.                            | 150 15.                          | ¥2 N                                 | and             | <ol> <li>Can be<br/>wall in<br/>2. Install<br/>(can us<br/>gas.</li> <li>ERATION<br/>1. No spec</li> </ol> | installed<br>-line or a<br>ation by<br>e offshoo<br>& MAINTE<br>fal train                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cylinder moun<br>cabinet mounte<br>qualified pers<br>t of effluent)<br>ENANCE REQU      | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | njeci      |
| ot<br>2. Opt<br>COSTS<br>1. Ch'<br>abc<br>2. Boo                       | zing is<br>PPD<br>r ] ppm<br>eration<br>lorine<br>out 6-9<br>oster p<br>TECH<br>(R-%                | determ<br>- GPM :<br>= 8,34<br>possib<br>costs ri<br>¢/lb. fi<br>umps rul<br>NHCAL PEL<br>s REDUCTI | ined by<br>x .012 :<br>1b./M (<br>le at 1,<br>un about<br>or ton (<br>n about<br>RFORMAN<br>100, A - A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ppm des<br>ppm des<br>pals. of<br>20 of m<br>t 15-17(<br>containe<br>\$115 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | estred<br>feffluen<br>naximum ra<br>t/1b. for<br>ers.<br>\$500.                            | 0PERATI                          | ¥2 N                                 | and OP          | 1. Can be<br>wall in<br>2. Install<br>(can us<br>gas.<br>ERATION<br>1. No spec                             | installed<br>-line or a<br>ation by<br>e offshoo<br>& MAINTE<br>fal train                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cylinder moun<br>cabinet mounte<br>qualified pers<br>t of effluent)<br>ENANCE REQU      | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | injec t    |
| 07<br>2. 0pc<br>COSTS<br>1. Ch<br>abc<br>2. Boo                        | zing is<br>PPD<br>r ] ppm<br>eration<br>lorine<br>out 6-9<br>oster p<br>TECH<br>(R-%                | determ<br>- GPM :<br>= 8,34<br>possib<br>costs ri<br>¢/lb. fi<br>umps rul<br>NHCAL PEL<br>s REDUCTI | ined by<br>x .012 :<br>1b./M (<br>le at 1,<br>un about<br>or ton (<br>n about<br>RFORMAN<br>100, A - A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ppm des<br>ppm des<br>pals. of<br>20 of m<br>t 15-17(<br>containe<br>\$115 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | estred<br>feffluen<br>naximum ra<br>t/1b. for<br>ers.<br>\$500.                            | 0PERATI                          | ¥2 N                                 | and OP          | 1. Can be<br>wall in<br>2. Install<br>(can us<br>gas.<br>ERATION<br>1. No spec                             | installed<br>-line or a<br>ation by<br>e offshoo<br>& MAINTE<br>fal train                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cylinder moun<br>cabinet mounte<br>qualified pers<br>t of effluent)<br>ENANCE REQU      | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | nject      |
| 01<br>2. 0pd<br>COSTS<br>1. Ch <sup>1</sup><br>abc<br>2. Boo           | zing is<br>PPD<br>r ] ppm<br>eration<br>lorine<br>out 6-9<br>oster p<br>TECH<br>(R-%                | determ<br>- GPM :<br>= 8,34<br>possib<br>costs ri<br>¢/lb. fi<br>umps rul<br>NHCAL PEL<br>s REDUCTI | ined by<br>x .012 :<br>1b./M (<br>le at 1,<br>un about<br>or ton (<br>n about<br>RFORMAN<br>100, A - A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ppm des<br>ppm des<br>pals. of<br>20 of m<br>t 15-17(<br>containe<br>\$115 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | estred<br>feffluen<br>naximum ra<br>t/1b. for<br>ers.<br>\$500.                            | 0PERATI                          | ¥2 N                                 | and OP          | 1. Can be<br>wall in<br>2. Install<br>(can us<br>gas.<br>ERATION<br>1. No spec                             | installed<br>-line or a<br>ation by<br>e offshoo<br>& MAINTE<br>fal train                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cylinder moun<br>cabinet mounte<br>qualified pers<br>t of effluent)<br>ENANCE REQU      | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | injec t    |
| ot<br>2. Opt<br>COSTS<br>1. Ch'<br>abc<br>2. Boo                       | zing is<br>PPD<br>r ] ppm<br>eration<br>lorine<br>out 6-9<br>oster p<br>TECH<br>(R-%                | determ<br>- GPM :<br>= 8,34<br>possib<br>costs ri<br>¢/lb. fi<br>umps rul<br>NHCAL PEL<br>s REDUCTI | ined by<br>x .012 :<br>1b./M (<br>le at 1,<br>un about<br>or ton (<br>n about<br>RFORMAN<br>100, A - A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ppm des<br>ppm des<br>pals. of<br>20 of m<br>t 15-17(<br>containe<br>\$115 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | estred<br>feffluen<br>naximum ra<br>t/1b. for<br>ers.<br>\$500.                            | 0PERATI                          | ¥2 N                                 | and OP          | 1. Can be<br>wall in<br>2. Install<br>(can us<br>gas.<br>ERATION<br>1. No spec                             | installed<br>-line or a<br>ation by<br>e offshoo<br>& MAINTE<br>fal train                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cylinder moun<br>cabinet mounte<br>qualified pers<br>t of effluent)<br>ENANCE REQU      | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | nject      |
| or<br>2. Ope<br>COSTS<br>1. Ch<br>abo<br>2. Boo                        | zing is<br>PPD<br>r ] ppm<br>eration<br>lorine<br>out 6-9<br>oster p<br>TECH<br>(R-%                | determ<br>- GPM :<br>= 8,34<br>possib<br>costs ri<br>¢/lb. fi<br>umps rul<br>NHCAL PEL<br>s REDUCTI | ined by<br>x .012 :<br>1b./M (<br>le at 1,<br>un about<br>or ton (<br>n about<br>RFORMAN<br>100, A - A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ppm des<br>ppm des<br>pals. of<br>20 of m<br>t 15-17(<br>containe<br>\$115 -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | estred<br>feffluen<br>naximum ra<br>t/1b. for<br>ers.<br>\$500.                            | 0PERATI                          | ¥2 N                                 | and OP          | 1. Can be<br>wall in<br>2. Install<br>(can us<br>gas.<br>ERATION<br>1. No spec                             | installed<br>-line or a<br>ation by<br>e offshoo<br>& MAINTE<br>fal train                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cylinder moun<br>cabinet mounte<br>qualified pers<br>t of effluent)<br>ENANCE REQU      | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | njec       |
| OT<br>2. Ope<br>COSTS<br>1. Ch<br>abd<br>2. Bot<br>OBLANDRI<br>GRANDRI | zing is<br>PPD<br>r ) ppm<br>ration<br>lorine to<br>ooster p<br>TECHC<br>(A + x<br>SOO <sub>6</sub> | determ<br>- GPH<br>- 8,24<br>possib<br>costs ri<br>                                                 | ined by x.ol2 x.ol | ppm des (c ppm de (c ppm d | estred<br>r effluen<br>naximum ra<br>t/lb. for<br>ers.<br>\$500.<br>UT<br>ALUE<br>CE<br>CE | 0PERATII<br>RANGEI<br>TTEMP, OTI | ¥2 N                                 | and OP          | 1. Can be<br>wall in<br>2. Install<br>(can us<br>gas.<br>ERATION<br>1. No spec                             | installedine orine | cylinder mount<br>abinet mounte<br>qualified pers<br>t of effluent)<br>ing required f   | d.<br>onnel: ne<br>, booster  <br><b>  REMENTS</b> | ed water for<br>pumps, vent, s        | njec       |

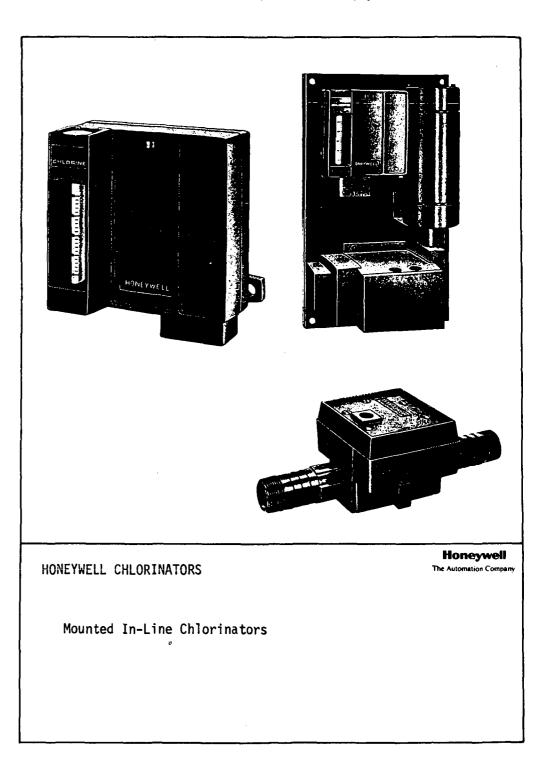
NOTE: The above data are based on information supplied by the manufacturer. Demonstration Water Project cannot assume responsibility for their accuracy. Please contact manufacturer for latest specifications and prices.

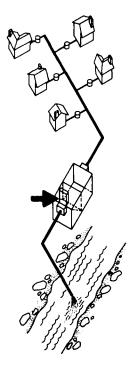
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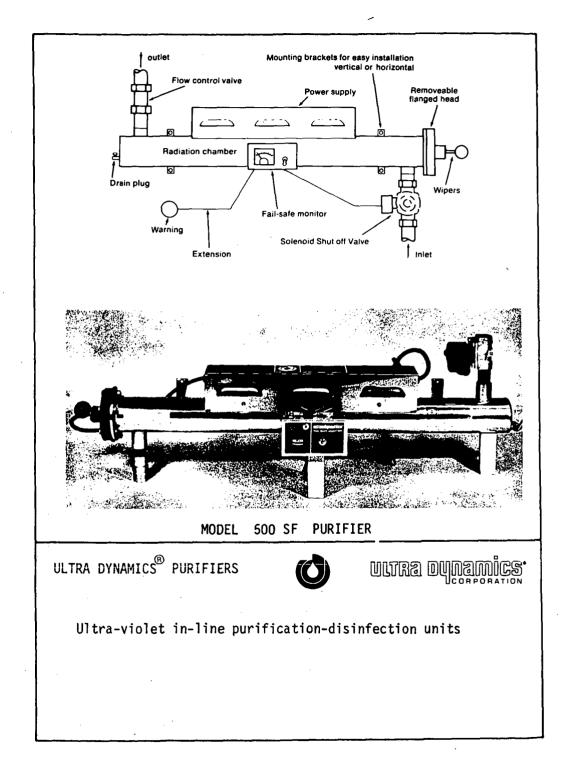


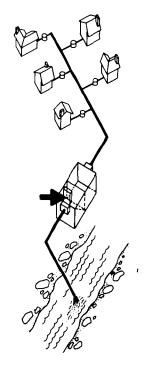






| 110<br>FO                                          | 00 VIR<br>RT W/<br>(5) 643                                    | RIAL D<br>IGINIA<br>ASHINO<br>F1300 | IVISION<br>DRIVE<br>STON, PA<br>r Manager |                                          |                                            |                            |                                  |           |                                                             |                                        |                                                                | L CHLORIN                                                                                          |          |
|----------------------------------------------------|---------------------------------------------------------------|-------------------------------------|-------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------|----------------------------------|-----------|-------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------|
| reg<br>2. Reg<br>los<br>3. Wal<br>4. Out<br>5. Rem | uum op<br>ulator<br>ulator<br>t.<br>1, cyl<br>of-ga<br>юte in | inder,<br>jectio                    | box and<br>off chlor                      | in-line<br>ine whe<br>ainer,<br>1g possi | ejector.<br>n water s<br>and cabir<br>ble. | upply or                   | vacuum<br>vacuum is<br>d models. | C         | <ol> <li>Gas pass</li> <li>Water un<br/>vacuum 1</li> </ol> | ses throug<br>nder press<br>for drawin | h rotameter and fl<br>ure passes through<br>g gas into water s | roller by in-line v<br>low rate adjusting<br>1 injector creating<br>supply.<br>spplication via dif | alve.    |
|                                                    | _                                                             | DIMENSI                             |                                           | r –                                      |                                            | 1                          |                                  |           | A (14)                                                      |                                        | UTILITY REQUIREM                                               |                                                                                                    | <u> </u> |
| MODEL<br>NUMBER<br>(MAJOR)                         | LENGT                                                         | <b>T</b>                            | T                                         | WEIGHT                                   | RATED<br>CAPACITY<br>(GPD)                 | TANK<br>CAPACITY<br>(GAL.) | SLIGG. LIST<br>(FOB<br>FACTORY)  | INSTALL   |                                                             | DESIGN<br>LIFETIME<br>(YRL)            | ELECTRICITY<br>(RATING)                                        | OPERATING<br>SUPPLIES                                                                              |          |
| S543-21<br>(Wall)                                  | 6 <u>3</u> "                                                  | 6 <u>1</u>                          | ' 9 <mark>1</mark> "                      | 25                                       | 4-500<br>PPD                               |                            | 600 -<br>1200                    |           | See<br>Costs<br>Below                                       |                                        | None,unless<br>booster<br>pump needed                          | Chlorine,<br>water for<br>ejector,pum                                                              | P        |
| 5543-25<br>Cabinet)                                | 26 <mark>3</mark> *                                           | 15"                                 | 66"                                       | 200                                      |                                            |                            | 1400 -<br>1600                   |           | "                                                           |                                        | u                                                              |                                                                                                    |          |
| Injector                                           | 1112                                                          | 41                                  | <u>5</u> 3 <u>5</u> "                     | 3                                        |                                            | ļ                          |                                  |           |                                                             |                                        |                                                                |                                                                                                    | ļ        |
| abo<br>2. Boo                                      | ut 6-9<br>ister p                                             | ¢/1b.<br>umps ri                    | for ton c<br>in about                     | :ontaine<br>\$115 -                      | rs.                                        |                            | cylinders                        |           | PERATION                                                    | & MAINTE                               | NANCE REQUIREN                                                 | MENTS                                                                                              |          |
| MODEL<br>NUMBER                                    | TECI<br>(A -                                                  | NICAL P                             | ERFORMAN<br>TION, A - A                   | CE-OUTP                                  | UT<br>ALUE)                                | OPERATI                    |                                  | DISE<br>& | STANDARDS                                                   |                                        |                                                                |                                                                                                    |          |
| (MAJOR)                                            | 8006                                                          | 55                                  |                                           |                                          |                                            | ITEMP. OT                  |                                  |           |                                                             |                                        |                                                                |                                                                                                    |          |
|                                                    |                                                               |                                     | 1                                         | 1                                        | 1                                          |                            |                                  |           |                                                             |                                        |                                                                |                                                                                                    |          |
|                                                    |                                                               |                                     | NTEES,                                    |                                          | ICE<br>rkmanship                           |                            |                                  | Т         |                                                             | ABS housin                             | ANCE<br>g; tantalum-tungst<br>cy of ± 4% over 20               |                                                                                                    |          |





|                                                                                                                                                                                      | AIT ST<br>TERSO<br>1) 684                                                                                                               | TREET<br>N, NEW<br>5900                                                                                                                        | ICS COR<br>V JERSE<br>110 E. W                                                                                                                                     | Y 0752                                                                                                                                  | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                       | PURI                                                                                                                                        | DYNAMI<br>FIERS                                                                      |                                |
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| uni<br>300<br>2. In-<br>and<br>cha<br>3. U.V<br>wip                                                                                                                                  | ctronic<br>ts of 3<br>to 72,<br>line ur<br>alarm<br>nge, dr<br>. lamp<br>er-clea                                                        | 304 stai<br>,000 GPH<br>nits hav<br>for mal<br>rains, r<br>enclose<br>aners.                                                                   | inless s<br>H.<br>ve "fail<br>Ifunctio<br>removabl<br>rd in qu                                                                                                     | teel pu<br>-safe"<br>ns, 60<br>e flang<br>artz ja                                                                                       | monitor a<br>second qu<br>ge heads,<br>acket wit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | tra-violet<br>er at cons<br>with soler<br>uartz and<br>flow cont<br>h manual c<br>2 protecti                                                                  | tant flow<br>oid shut-<br>U.V. lamp<br>rol valve<br>or automat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ction<br>vs of<br>off<br>off<br>s,<br>tic                                                            | valve i<br>2. Treated<br>radiati<br>and is<br>3. Treated                                                                                                                                                | t enters r<br>nlet.<br>wastewate<br>on is emit<br>absorbed b                                                                                                                                                                      | adiation cham<br>r passes thro<br>ted by lamp,<br>y organisms w<br>ves chamber a                                                                                                                                                                                                                                                                                                                            | wber through<br>hugh chamber<br>passes thro<br>which are de                                                                                 | solenoid shu<br>, ultra-viole<br>ugh quartz ja<br>stroyed on in<br>flow regulate     | utoff<br>et<br>icket<br>ipact. |
|                                                                                                                                                                                      |                                                                                                                                         |                                                                                                                                                |                                                                                                                                                                    | <u> </u>                                                                                                                                | r                                                                                                                                                                                                                                     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                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                             |                                                                                      | <del></del>                    |
| MODEL<br>NUMBER                                                                                                                                                                      |                                                                                                                                         | PIMENSIO                                                                                                                                       | r T                                                                                                                                                                | WEIGHT                                                                                                                                  | RATED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TANK                                                                                                                                                          | SUGG. LIST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | INSTALL                                                                                              |                                                                                                                                                                                                         | DESIGN<br>LIFETIME                                                                                                                                                                                                                | UTILITY REC                                                                                                                                                                                                                                                                                                                                                                                                 | JOINEMENTS                                                                                                                                  |                                                                                      |                                |
| (MAJOR)                                                                                                                                                                              | LENGTH                                                                                                                                  |                                                                                                                                                | HEIGHT                                                                                                                                                             |                                                                                                                                         | (GPH)<br>2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (GAL.)                                                                                                                                                        | (FOB<br>FACTORY)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | COST                                                                                                 | COST 3                                                                                                                                                                                                  | (YRB.)                                                                                                                                                                                                                            | (RATING)                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                             |                                                                                      | I                              |
| 500-SF                                                                                                                                                                               | 41"                                                                                                                                     | 101                                                                                                                                            | 7"                                                                                                                                                                 | 38                                                                                                                                      | 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | NA                                                                                                                                                            | \$650.<br>(Lamp -<br>\$39)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | See<br>Costs<br>Below                                                                                | 27/yr.                                                                                                                                                                                                  | Lamp -<br>1 yr.                                                                                                                                                                                                                   | 120 V AC<br>60 Hz<br>40 W                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                             | None                                                                                 |                                |
| 2000-<br>SF-HP                                                                                                                                                                       |                                                                                                                                         | 157                                                                                                                                            | 121"                                                                                                                                                               | 79                                                                                                                                      | 2000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                               | \$1530.<br>(Lamps -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | . u                                                                                                  | 110/yr.                                                                                                                                                                                                 |                                                                                                                                                                                                                                   | 120 V AC<br>60 Hz                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                             |                                                                                      |                                |
| 6000-2                                                                                                                                                                               | <i></i>                                                                                                                                 | 12 <sup>1</sup> "                                                                                                                              | <u>↓ · · · ·</u>                                                                                                                                                   |                                                                                                                                         |                                                                                                                                                                                                                                       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                                                                                                                          | 160 W<br>110/120 V                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                             | <u> </u>                                                                             | <b> </b>                       |
| SF-HP                                                                                                                                                                                | 52"                                                                                                                                     | 122                                                                                                                                            | 27 <u>1</u> "                                                                                                                                                      | 145                                                                                                                                     | 6000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ļ                                                                                                                                                             | (2" Fe-<br>male IPS<br>\$5625.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                      | 220/yr.                                                                                                                                                                                                 |                                                                                                                                                                                                                                   | 50/60 Hz<br>400 M<br>110/120 V                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                             | ļ                                                                                    | <b> </b>                       |
| 12000-4<br>SF-HP                                                                                                                                                                     | 57 <u>1</u> "                                                                                                                           |                                                                                                                                                | 57 <u>1</u> "                                                                                                                                                      | 290                                                                                                                                     | 12000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | "                                                                                                                                                             | (2" Fe-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                      | 438/yr.                                                                                                                                                                                                 |                                                                                                                                                                                                                                   | 50/60 Hz                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                             |                                                                                      |                                |
| SIZING 8<br>1. Dif<br>inl<br>4"<br>2. For<br>COSTS<br>1. For<br>sli                                                                                                                  | ferent<br>et IPS.<br>standar<br>220 vo<br>models<br>ghtly m                                                                             | VTH PO<br>sized m<br>Model<br>rd flang<br>blt/50 H<br>3000-1<br>nore.                                                                          | nodels f<br>ls 3000-<br>ge.<br>fz opera<br>12000, t                                                                                                                | L<br>rom 250<br>12000 G<br>tion, s<br>he 3" o                                                                                           | SPH in 2"<br>step-down<br>or 4" sta                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | GPH in 3/<br>inlet IPS<br>transform<br>ndard flan                                                                                                             | 4" or 2"<br>i or 3" o<br>ær needed<br>ge costs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                      | NSTALLATI<br>1. Electri<br>tion -<br>ca 30-6<br>2. 120 V A<br>PERATION<br>1. On manu<br>2. Replace                                                                                                      | ON REQUI<br>cal and pl<br>after pres<br>0 min. ins<br>C standard<br><b>&amp; MAINTE</b><br>al wipers,<br>lamps eve                                                                                                                | umbing skills<br>sure tank, me<br>tallations.<br>equipment.<br>NANCE REQL<br>activate onc<br>ry 10 months                                                                                                                                                                                                                                                                                                   | required f<br>ter or seco<br>UIREMENTS<br>ie daily (pu<br>continuous                                                                        | operation.                                                                           | ent -                          |
| SIZING 4<br>1. Dif<br>inl<br>4"<br>2. For<br>COSTS<br>1. For<br>sli<br>2. All<br>con<br>3. Acc.                                                                                      | GROW<br>ferent<br>et IPS.<br>standar<br>220 vo<br>models<br>ghtly m<br>models<br>trols o<br>essorie<br>orders,<br>TECH                  | VTH PO<br>sized n<br>Model<br>d flang<br>blt/50 F<br>s 3000-1<br>s availa<br>r autor<br>es inclu<br>, shut-c                                   | TENTIA<br>models f<br>ls 3000-<br>ge.<br>iz opera<br>l2000, t<br>l2000, t<br>lable with<br>natic qu<br>ude: "fa<br>off valy                                        | L<br>rom 250<br>12000 G<br>tion, s<br>he 3" o<br>h or wi<br>artz ja<br>il-safe<br>es, flo<br>cceourp                                    | PH in 2"<br>itep-down<br>or 4" star<br>ithout "fr<br>icket wip<br>" monito<br>w contro<br>ur                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | GPH in 3/<br>inlet IPS<br>transform<br>ndard flan<br>ail-safe"                                                                                                | 4" or 2"<br>or 3" or<br>ge costs<br>monitor<br>nsors), o<br>5-90 GPM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | hart                                                                                                 | NSTALLATI<br>1. Electri<br>tion -<br>ca 30-6<br>2. 120 V A<br>PERATION<br>1. On manu<br>2. Replace<br>3. Occasio<br>lamp th                                                                             | ON REQUI<br>cal and plu<br>after pres<br>0 min. ins<br>C standard<br>& MAINTE<br>al wipers,<br>lamps eve<br>nal cleani<br>rough view                                                                                              | REMENTS<br>umbing skills<br>sure tank, me<br>tallations.<br>equipment.<br>NANCE REQU<br>activate onc<br>ry 10 months<br>ng and water                                                                                                                                                                                                                                                                        | required f<br>ter or seco<br>UIREMENTS<br>ie daily (pu<br>continuous                                                                        | ndary treatme<br>sh-pull).                                                           | ent -                          |
| SIZING A<br>1. Dif<br>inl<br>4"<br>2. For<br>COSTS<br>1. For<br>sli<br>2. All<br>con<br>3. Acc.<br>rec<br>MODEL<br>MUMMER                                                            | GROW<br>ferent<br>et IPS.<br>standar<br>220 vo<br>models<br>ghtly m<br>models<br>trols o<br>essorie<br>orders,<br>TECH                  | VTH PO<br>sized n<br>Model<br>d flang<br>blt/50 F<br>3000-1<br>more.<br>s availa<br>or autor<br>s inclu<br>, shut-c<br>s REDUCT                | TENTIA<br>nodels f<br>ls 3000-<br>gé.<br>lz opera<br>l2000, t<br>lable wit<br>natic qu<br>ude: "fa<br>off valy                                                     | L<br>rom 250<br>12000 G<br>tion, s<br>he 3" o<br>h or wi<br>artz ja<br>il-safe<br>es, flo<br>iCE-OUTP<br>CTUAL V                        | SPH in 2"<br>step-down<br>or 4" stau<br>ithout "fi<br>icket wip<br>s" monito<br>w contro<br>UT<br>ALUE<br>Bio-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | GPH in 3/<br>inlet IPS<br>transform<br>ndard flan<br>ail-safe"<br>ers.<br>rs (1-4 se<br>1 valves (                                                            | 4" or 2"<br>or 3" or<br>ge costs<br>monitor<br>nsors), c<br>5-90 GPN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | J.<br>Diant                                                                                          | NSTALLATI<br>1. Electri<br>tion -<br>ca 30-6<br>2. 120 V A<br>PERATION<br>1. On manu<br>2. Replace<br>3. Occasio                                                                                        | ON REQUI<br>cal and pl<br>after pres<br>0 min. ins<br>C standard<br>& MAINTE<br>al wipers,<br>lamps even<br>nal clean<br>rough view                                                                                               | REMENTS<br>umbing skills<br>sure tank, me<br>tallations.<br>equipment.<br>NANCE REQU<br>activate onc<br>ry 10 months<br>ng and water                                                                                                                                                                                                                                                                        | required f<br>ter or seco<br>UIREMENTS<br>ie daily (pu<br>continuous                                                                        | ndary treatme<br>sh-pull).<br>operation.                                             | ent -                          |
| SIZING 8<br>1. Dif<br>1. Dif<br>4"<br>2. For<br>COSTS<br>1. For<br>sli<br>2. All<br>con<br>3. Acc.<br>rec<br>mODEL<br>NUMBER<br>(MAJOR)                                              | models<br>ghtly m<br>models<br>ghtly m<br>models<br>trols o<br>essorie<br>orders,<br>TECH<br>(R-M                                       | VTH PO<br>sized n<br>Model<br>d flang<br>blt/50 F<br>3000-1<br>more.<br>s availa<br>or autor<br>s inclu<br>, shut-c<br>s REDUCT                | TENTIA<br>nodels f<br>ls 3000-<br>ge.<br>12 opera<br>12000, t<br>able with<br>natic qu<br>ude: "fa<br>off valy<br>RFORMAN                                          | L<br>rom 250<br>12000 G<br>tion, s<br>he 3" o<br>h or wi<br>artz ja<br>i1-safe<br>es, flo<br>ctout<br>CTUAL V                           | PH in 2"<br>tep-down<br>or 4" stan<br>ithout "fri<br>cket wipp<br>" monito<br>w contro<br>ut<br>ALUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | GPH in 3/<br>inlet IPS<br>transform<br>ndard flan<br>atl-safe"<br>ers.<br>rs (1-4 se<br>1 valves (<br>OPERATII<br>RANGE                                       | 4" or 2"<br>or 3" or<br>ser needed<br>ige costs<br>monitor<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(s-90 GPN)<br>(s | Noise<br>Noise<br>Noise<br>Noise<br>Noise<br>Noise<br>Noise<br>Noise                                 | NSTALLATI<br>1. Electrition -<br>ca 30-6<br>2. 120 V A<br>PERATION<br>1. On manu<br>2. Replace<br>3. Occasio<br>lamp th<br>STANDARDA                                                                    | ON REQUI<br>cal and pl<br>after pres<br>D mfn. ins<br>C standard<br>a MAINTE<br>al wipers,<br>lamps even<br>nal cleani<br>rough view<br>U.V.<br>gn 1 -<br>1 -<br>ant 7 so<br>1 -<br>ant 7 so                                      | REMENTS<br>umbing skills<br>sure tank, me<br>tallations.<br>equipment.<br>NANCE REOL<br>activate onc<br>up 10 months<br>ng and water<br>ports.                                                                                                                                                                                                                                                              | required f<br>iter or seco<br>JIREMENTS<br>e daily (pu<br>continuous<br>quality tes                                                         | ndary treatme<br>sh-pull).<br>operation.<br>ting, viewing                            | ent -                          |
| Sizing a<br>1. Dif<br>1. Dif<br>1. The<br>4"<br>2. For<br>COSTS<br>1. For<br>5. All<br>con<br>3. Acc.<br>rec.<br>MODEL<br>NUMBER<br>(MAJOR)<br>500-SF<br>2000-                       | models<br>ghtly m<br>models<br>ghtly m<br>models<br>trols o<br>essorie<br>orders,<br>TECH<br>(R-M                                       | VTH PO<br>sized n<br>Model<br>d flang<br>blt/50 F<br>3000-1<br>more.<br>s availa<br>or autor<br>s inclu<br>, shut-c<br>s REDUCT                | TENTIA<br>nodels f<br>ls 3000-<br>ge.<br>12 opera<br>12000, t<br>able with<br>natic qu<br>ude: "fa<br>off valy<br>RFORMAN                                          | L<br>rom 250<br>12000 G<br>tion, s<br>he 3" o<br>h or wi<br>artz ja<br>i1-safe<br>es, flo<br>ctout<br>CTUAL V                           | PH in 2"<br>step-down<br>or 4" stan<br>ithout "fi<br>cket wip<br>" monito<br>" monito<br>w contro<br>UT<br>ALVE!<br>Bio-<br>banisms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | GPH in 3/<br>inlet IPS<br>transform<br>ndard flan<br>ail-safe"<br>ers.<br>rs (1-4 se<br>valves (<br>OPERATH<br>RANGE:<br>I to PS<br>working p<br>working p    | 4" or 2"<br>or 3" or<br>ser needed<br>ige costs<br>monitor<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(en) (<br>(s-90 GPN)<br>(s-90 GPN)<br>(s | hart<br>bootse<br>bootse<br>noise,<br>ite or<br>ors.                                                 | NSTALLATI<br>1. Electrition<br>tion - ca 30-6<br>2. 120 VA<br>PERATION<br>1. On manu<br>2. Replace<br>3. Occasion<br>lamp th<br>STANDARDE<br>CODES MET<br>U.S., forei<br>Patents gr                     | ON REQUI<br>cal and pla<br>after pres<br>0 min. ins<br>C standard<br><b>&amp; MAINTE</b><br>al wipers,<br>lamps even<br>nal cleani<br>rough view<br><b>b</b><br>U.V.<br>gn<br>ant. 7,50<br>dinc. 7,50<br>4 -                      | REMENTS<br>umbing skills<br>usure tank, me<br>tallations.<br>equipment.<br>NANCE REOL<br>activate onc<br>ry 10 months<br>ng and water<br>ports.<br>Lamps<br>J.V. (1-chamb                                                                                                                                                                                                                                   | JIREMENTS<br>daily (pu<br>continuous<br>quality tes                                                                                         | ndary treatme<br>sh-pull).<br>operation.<br>ting, viewing<br>er)                     | ent -                          |
| SIZING a<br>1. Dif<br>in]<br>4"<br>2. For<br>COSTS<br>1. For<br>sli<br>2. All<br>con<br>3. Acc.<br>rec.<br>MODEL                                                                     | models<br>ghtly m<br>models<br>ghtly m<br>models<br>trols o<br>essorie<br>orders,<br>TECH<br>(R-M                                       | VTH PO<br>sized n<br>Model<br>d flang<br>blt/50 F<br>3000-1<br>more.<br>s availa<br>or autor<br>s inclu<br>, shut-c<br>s REDUCT                | TENTIA<br>nodels f<br>ls 3000-<br>ge.<br>12 opera<br>12000, t<br>able with<br>natic qu<br>ude: "fa<br>off valy<br>RFORMAN                                          | L<br>rom 250<br>12000 G<br>tion, s<br>he 3" o<br>h or wi<br>artz ja<br>i1-safe<br>es, flo<br>CE-OUTP<br>CTUAL V<br>PD (RI<br>0rc<br>99. | PH in 2"<br>tep-down<br>or 4" stan-<br>thout "fn<br>icket wip<br>" monito<br>w contro<br>tr<br>autor<br>Bio-<br>banisms<br>92 kill                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GPH in 3/<br>inlet IPS<br>transform<br>ndard flan<br>ail-safe"<br>ers.<br>1 valves (<br>OPERATH<br>TRANGE<br>TIS-TUO PS<br>working t<br>temperate             | 4" or 2"<br>or 3" or<br>ser needec<br>ige costs<br>monitor<br>(5-90 GPM<br>NG (<br>iten) (<br>c)<br>rres.; tas<br>env. odd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | hart<br>books<br>roise<br>books                                                                      | NSTALLATI<br>1. Liectri<br>tion -<br>ca 30-6<br>2. 120 V A<br>PEFATION<br>1. On manu<br>2. Replace<br>3. Occasion<br>1. amp th<br>STANDARDA<br>CODES MET<br>U.S., forei<br>Patents gr<br>ed and pen     | ON REQUI<br>cal and pla<br>fter pres<br>0 min. Ins<br>C standard<br>C standard<br>A MAINTE<br>al wipers,<br>lamps even<br>al cleani<br>rough view<br>U.V.<br>gn<br>ant<br>7,50<br>din<br>7,50<br>din<br>8 -<br>7,50<br>8 -<br>8 - | REMENTS<br>umbing skills<br>umbing skills<br>sure tank, me<br>tallations.<br>equipment.<br>NANCE REOL<br>activate onc.<br>y 10 months<br>ng and water<br>ports.<br>Lamps<br>J.V. (1-chamb<br>J.Y. (1-chamb                                                                                                                                                                                                  | required f<br>ter or seco<br>JIREMENTS<br>te daily (pu<br>continuous<br>quality tes<br>ered purifi                                          | ndary treatme<br>sh-pull).<br>operation.<br>ting, viewing<br>er)<br>er)              | ent -                          |
| SIZING 8<br>1. Dif<br>in1<br>4"<br>2. For<br>COSTS<br>1. For<br>sli<br>2. All<br>con<br>3. Acc.<br>rec<br>model<br>NUMBER<br>(DAJON 4<br>500-SF<br>2000-<br>SF-HP<br>6000-2          | models<br>ghtly m<br>models<br>ghtly m<br>models<br>trols o<br>essorie<br>orders,<br>TECH<br>(R-M                                       | VTH PO<br>sized n<br>Model<br>d flang<br>blt/50 F<br>3000-1<br>more.<br>s availa<br>or autor<br>s inclu<br>, shut-c<br>s REDUCT                | TENTIA<br>nodels f<br>ls 3000-<br>ge.<br>12 opera<br>12000, t<br>able with<br>natic qu<br>ude: "fa<br>off valy<br>RFORMAN                                          | L rom 250<br>12000 C<br>tion, s<br>he 3° c<br>h or wi<br>artz ja<br>il-safe<br>cs, flo<br>ccourp<br>crual v<br>p<br>99.                 | PH in 2"<br>tep-down<br>ithout "fi<br>cket wip<br>"monito<br>w contro<br>tro<br>ALUE!<br>BTO-<br>anisms<br>9% kill<br>"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | GPH in 3/<br>inlet IPS<br>transform<br>ail-safe"<br>ers.<br>rs (1-4 se<br>1 valves (<br>OPERATH<br>RANGET<br>TEAM, OT<br>1 S-100 PS<br>working p<br>temperate | 4" or 2"<br>or 3" or<br>ser needed<br>ige costs<br>monitor<br>(soors), o<br>5-90 GPN<br>NG<br>I<br>I No<br>res, tas<br>res, tas<br>res, tas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | hart<br>books<br>roise<br>books                                                                      | NSTALLATI<br>1. Litectri<br>tion -<br>ca 30-6<br>2. 120 V A<br>PERATION<br>1. On manu<br>2. Replace<br>3. Occasion<br>lamp th<br>STANDARDA<br>CODES MET<br>V.S., foref<br>Patents gr<br>ed and pen<br>" | ON REQUI<br>Cal and pl<br>after pres<br>D min. Ins<br>C standard<br><b>&amp; MAINTE</b><br>al wipers,<br>lamps eve<br>nal cleani<br>rough view<br>U.V.<br>gn<br>ant. 7,50<br>4 -<br>7,50<br>8 -<br>Night<br>16 -<br>16 -          | REMENTS<br>umbing skills<br>usre tank, me<br>tallations.<br>equipment.<br>NANCE REQL<br>activate onc<br>ry 10 months<br>g and water<br>ports.<br>Lamps<br>J.Y. (1-chamb<br>D hr. life<br>J.Y. (1-chamb<br>J.Y. (1-chamb<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb)<br>J.Y. (1-chamb) | required f<br>ter or seco<br>JIREMENTS<br>e daily (pu<br>continuous<br>quality tes<br>vered purifi<br>vered purifi<br>2-chambered<br>1-Bac" | ndary treatme<br>sh-pull).<br>operation.<br>ting, viewing<br>er)<br>er)<br>purifier) | ent -                          |
| SIZING 4<br>1. Dif<br>in1<br>4"<br>2. For<br>COSTS<br>1. For<br>51<br>2. All<br>con<br>3. Acc.<br>rec.<br>MODEL<br>NUMBER<br>(MAJOR)<br>500-SF<br>2000-<br>SF-HP<br>12000-4<br>SF-HP | A GROW<br>Ferent<br>et 195.<br>220 vo<br>models<br>shtly n<br>models<br>shtly n<br>models<br>sorie<br>crders,<br>TECM<br>(A * 1<br>BOOR | VTH PO<br>sized n<br>Model<br>of flang<br>of flang<br>sit/50 H<br>s 3000-1<br>more.<br>s availa<br>or autor<br>s inclu,<br>s hut-c<br>s REDUCY | TENTIA<br>nodels f<br>ls 3000-<br>ge.<br>12 opera<br>12 opera<br>12 opera<br>12000, t<br>bble with<br>atic qu<br>de: "fa<br>off valy<br>RFORMATION, A - A<br>DO CC | L rom 250<br>12000 C<br>tion, s<br>he 3° C<br>h or winartz ja<br>i11-safe<br>es, f1C<br>es, f1C<br>or<br>y<br>99.                       | PH in 2"<br>:tep-down<br>it equation of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the standard of the 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No<br>res, t as<br>renv. odd                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             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Litectri<br>tion -<br>ca 30-6<br>2. EFRATION<br>1. On manu<br>2. Replace<br>3. Occasion<br>lamp th<br>STANDARDA<br>CODES MET<br>U.S., foreI<br>Patents gr<br>ed and pen<br>"            | ON REQUI<br>Cal and pl<br>after pres<br>D min. Ins<br>C standard<br><b>&amp; MAINTE</b><br>al wipers,<br>lamps eve<br>nal cleani<br>rough view<br>U.V.<br>gn<br>ant. 7,50<br>4 -<br>7,50<br>8 -<br>Night<br>16 -<br>16 -          | REMENTS<br>umbing skills<br>sure tank, me<br>tallations.<br>equipment.<br>NANCE REOL<br>activate onc.<br>y 10 months<br>ng and water<br>ports.<br>Lamps<br>J.V. (1-chamb<br>D hr. life<br>U.V. (1-chamb<br>D hr. life<br>U.V. (1-chamb<br>D hr. life<br>U.V. (4-chamb                                                                                                                                       | required f<br>ter or seco<br>JIREMENTS<br>e daily (pu<br>continuous<br>quality tes<br>vered purifi<br>vered purifi<br>2-chambered<br>1-Bac" | ndary treatme<br>sh-pull).<br>operation.<br>ting, viewing<br>er)<br>er)<br>purifier) | ent -                          |

## Disposal of Treated Wastewater

ADS Tubing-Corrugated Plastic Disposal Tubing, 278 Advanced Drainage Systems, Inc. Ameration Chamber-Subsurface Leaching Chamber, 280 American Precast Corp. Orangeburg Pipe-Bituminous Fibre Pipe, 282 The Flintkote Co. Effluent Diverter-Leaching Field Effluent Dosing Valve, 284 Franklin Research Channel Flow—Corrugated Plastic Drainage Tubing, 286 Hancor, Inc. Aquatower—Spray Irrigation Effluent Disposal Unit. 288 McDowell Manufacturing Co. M-E Permaline-Bituminous Fibre Pipe, 290 McGraw-Edison Co.

Rainbird—Sprinklers for Spray Irrigation, 292 Rainbird Sprinkler Manufacturing Co.

# Introduction

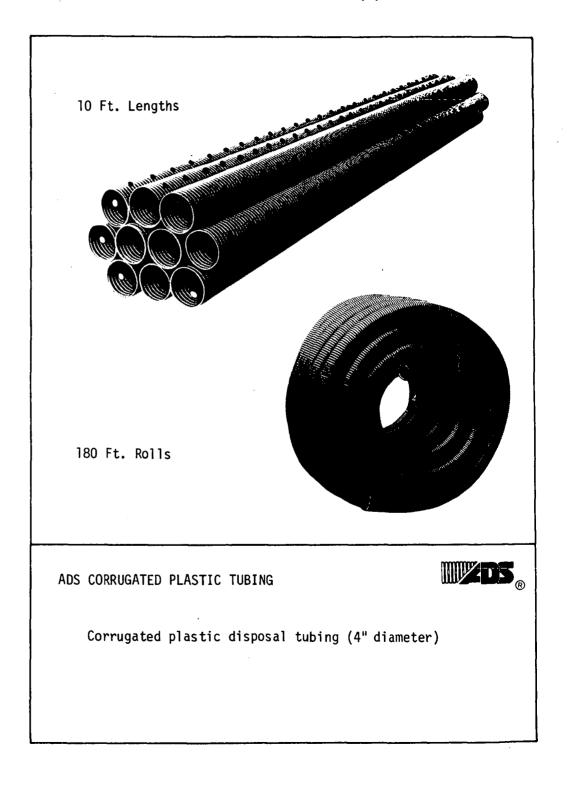
This section describes miscellaneous components for disposing of treated wastewater. Perforated bituminous fiber pipe and perforated corrugated high-density polyethylene pipe are included. The pipe conveys effluent from sewage treatment tanks through the subsurface soil absorption field. The effluent seeps out through the perforations and into the field. Clay tile (one-foot lengths of clay pipe) is also used for soil absorption fields. The tiles are laid with spacings of  $\frac{1}{9}$ -inch to  $\frac{1}{4}$ -inch to permit the effluent to seep out.

A fairly recent approach to subsurface disposal involves distribution of effluent into precast concrete chambers which are open at the bottom and which cover the absorption bed. The chambers may be installed with the tops at or below grade level. A system of vents is designed to maintain aerobic seepage conditions in the bed. Covers in the top surface of the chambers may be removed to permit access to the bed for inspection and repair. Restoration of a clogged bed can be speeded up by removing the cover and breaking up the clogging layer with a rake.

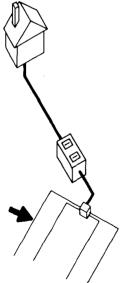
A two-way effluent diversion valve is described. The valve enables the user to switch the effluent from one soil absorption system to another in a dual installation. The alternating cycles are said to greatly prolong the lives of the fields.

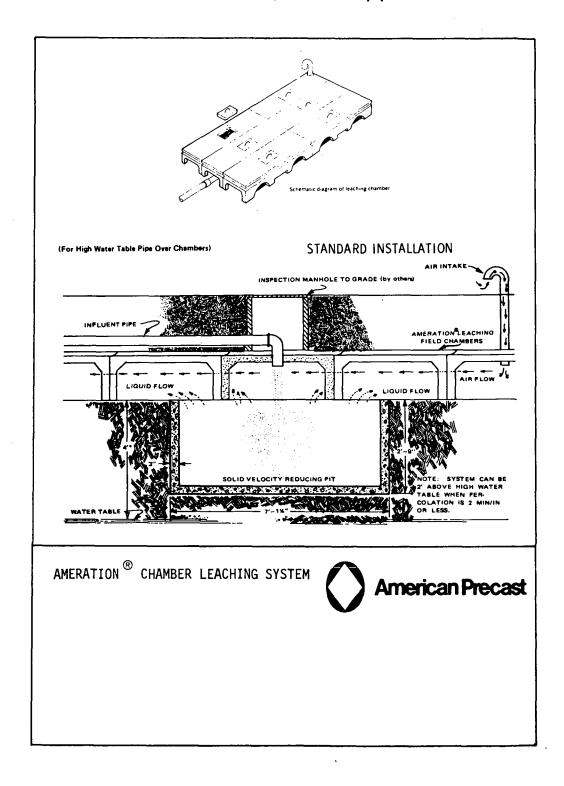
Finally, sprinkler nozzles for spray irrigation and a large tower-like rotating sprayer for the same purpose are described.

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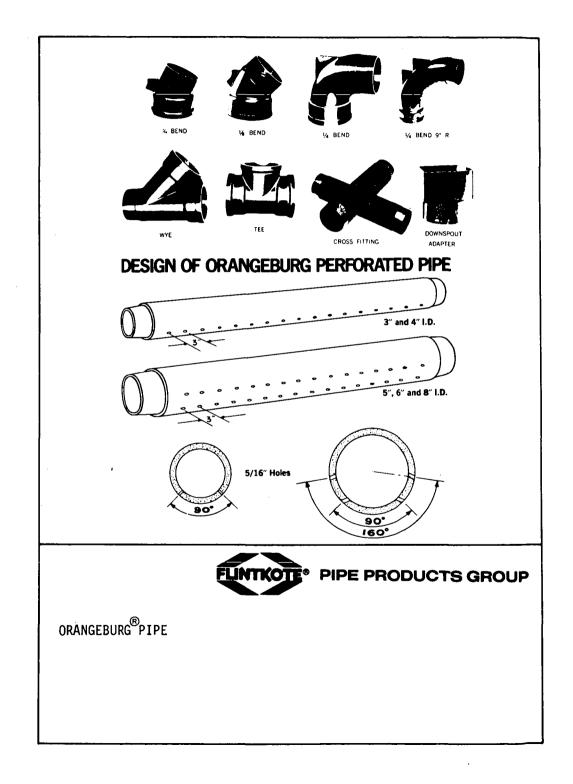


| 18                                       | 80 MA                                                            | CKEN<br>US, O                                          | ZIE D<br>HIO 4                                        | 3220                                          |                                        |                                        | , Marketing                                       | I                     |                             |                                                                                                                                                     |                                                                                                                    |                                                         |                                                       |                                                                                  | UBING                                         | :                   |
|------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------|----------------------------------------|----------------------------------------|---------------------------------------------------|-----------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------|---------------------|
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|                                          |                                                                  |                                                        |                                                       |                                               | - T                                    |                                        |                                                   |                       |                             |                                                                                                                                                     |                                                                                                                    |                                                         | _                                                     |                                                                                  |                                               | - <b>T</b>          |
| MODEL<br>NUMBER                          |                                                                  |                                                        | 1                                                     |                                               |                                        | RATED<br>MACITY                        |                                                   | SUGG. LIS             | OGTE (DO                    |                                                                                                                                                     | DESIGN                                                                                                             | 51.50                                                   | TRICITY                                               | OUIREMENTS                                                                       |                                               | •                   |
| (MAJOR)                                  | LENGTH                                                           |                                                        | HE                                                    |                                               |                                        | (GPD)                                  | (QAL.)                                            | (FOB                  |                             |                                                                                                                                                     | (YRS.)                                                                                                             |                                                         | TING)                                                 | ╞───                                                                             |                                               |                     |
| 402                                      | 10' &<br>180                                                     | 4"                                                     | round                                                 |                                               | 16.<br>/ft                             |                                        |                                                   | Varies:<br>ca 15¢/ft  | -                           | None                                                                                                                                                | Unlimite                                                                                                           | 1                                                       |                                                       |                                                                                  | Nater and<br>effluent                         | 1<br>               |
|                                          |                                                                  |                                                        |                                                       |                                               |                                        |                                        |                                                   |                       |                             |                                                                                                                                                     |                                                                                                                    |                                                         |                                                       |                                                                                  |                                               |                     |
|                                          |                                                                  |                                                        |                                                       |                                               |                                        |                                        |                                                   |                       |                             |                                                                                                                                                     | l<br>If prop                                                                                                       | <u> </u>                                                |                                                       | <u> </u>                                                                         | <b></b>                                       |                     |
| 1. Ada<br>2. Pr                          |                                                                  |                                                        |                                                       | additi                                        | ional c                                | costs.                                 |                                                   |                       |                             | 2. Flow ca                                                                                                                                          | pacities :<br>ht fills up                                                                                          | imilar                                                  | to sm                                                 | ooth-walled                                                                      | e conveyance<br>i pipe as wai<br>water on wai | er or               |
| MODEL<br>NUMBER<br>(MAJOR)               |                                                                  |                                                        |                                                       | MANCE-O                                       |                                        | JE)                                    | OPERATII<br>RANGES<br>(TEMP, OTH                  |                       | NOISE<br>B<br>ODORS         | STANDARD                                                                                                                                            | •                                                                                                                  | RATION<br>HOLE<br>SIZE                                  | S<br>SPACI                                            | 51                                                                               | RUSHING<br>'RENGTH<br>• BEARING <sup>2</sup>  | AVER/<br>"N         |
| 402                                      | NA                                                               | NA                                                     | NA                                                    | NA                                            |                                        |                                        | Subsurfac<br>gravity f                            | e, No<br>low if<br>in | odors,<br>proply<br>stalled | CS228-61<br>FHA Mat.<br>Release -                                                                                                                   | 3<br>619/ 2                                                                                                        | 1/2"<br>3/4"                                            | 4" 9<br>4" 9                                          | 120°<br>150°                                                                     | 600+                                          | 0.1                 |
|                                          |                                                                  |                                                        |                                                       |                                               |                                        | -                                      | <u>-</u>                                          |                       |                             |                                                                                                                                                     |                                                                                                                    |                                                         |                                                       |                                                                                  |                                               |                     |
|                                          |                                                                  |                                                        |                                                       |                                               |                                        |                                        |                                                   |                       |                             | <u> </u>                                                                                                                                            |                                                                                                                    |                                                         |                                                       |                                                                                  |                                               |                     |
|                                          |                                                                  |                                                        |                                                       |                                               |                                        |                                        |                                                   |                       |                             |                                                                                                                                                     |                                                                                                                    |                                                         |                                                       | 2                                                                                | lb./linear f                                  | t.                  |
|                                          |                                                                  |                                                        | I                                                     | L1                                            |                                        |                                        |                                                   |                       |                             | L                                                                                                                                                   |                                                                                                                    |                                                         |                                                       |                                                                                  | h./linear f                                   | t.                  |
| 2. ADS<br>yea<br>Cod<br>3. Ins           | ective<br>Corrug<br>rs when<br>e 606.<br>tallat                  | mater<br>gated<br>n inst<br>ion re                     | ial re<br>plasti<br>alled<br>commer                   | placed<br>c drain<br>accordi                  | (labor<br>hage tu<br>ing to<br>and a   | noti<br>bingi<br>the sp                | ncluded).<br>s guarant<br>lecificati<br>nal infor | ons of S              |                             | No. 619<br>3. Tubing<br>with As                                                                                                                     | pending.<br>ing meets<br>A, conform<br>has crush<br>TM C-4-55                                                      | CS 228<br>is to S<br>ing str                            | CS, Co<br>ength                                       | de 606.<br>in excess c                                                           | materials re<br>of 600 lb. ir                 | n acc               |
| 1. Def<br>2. ADS<br>yea<br>Cod<br>3. Ins | ective<br>Corrug<br>rs when<br>e 606.<br>tallat                  | mater<br>gated<br>n inst<br>ion re                     | ial re<br>plasti<br>alled<br>commer                   | placed<br>c drain<br>accordi                  | (labor<br>hage tu<br>ing to<br>and a   | noti<br>bingi<br>the sp                | s guarant<br>ecificati                            | ons of S              | cs                          | <ol> <li>Patents</li> <li>ADS tub<br/>No. 619</li> <li>Tubing<br/>with AS</li> <li>Tested<br/>Laborat</li> <li>COMMENTS</li> <li>Other t</li> </ol> | ; pending.<br>ing meets<br>A, confort<br>has crush<br>TM C-4-55<br>by Patzig<br>ory in 19<br>workman<br>ubing with | CS 228<br>is to S<br>ing str<br>Labora<br>O for<br>hip. | CS, Co<br>ength<br>tories<br>struct<br>ACCUR<br>thout | de 606.<br>in excess c<br>in 1971 ar<br>ural and cr<br>IATE AS OF<br>perforation | materials re                                  | ting<br>gth<br>1977 |

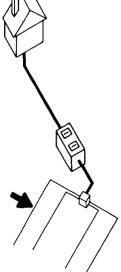


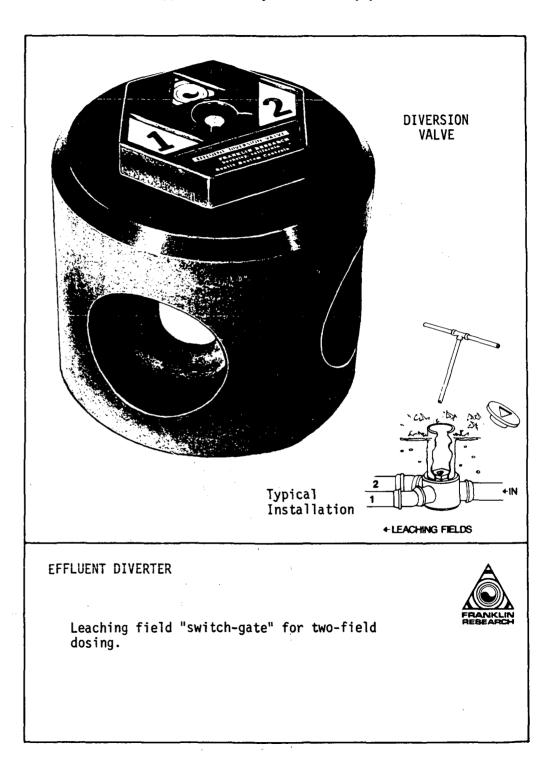


| (0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 4 MEAI<br>17) 877                                                                        | DOW S<br>GHAM,<br>- <b>5250</b>                                         | IT.<br>, MASS.                                                |                                                                      | TTS 0170                                                      | 1<br>ent, Amera                                                                 | tion Divisi                                  | 'n                                              |                                                                                                                  |                                                                                         |                                                                                                |                                              | CHAM<br>CHING CHAI           |
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| und<br>ver<br>2. Mar<br>3. Sur<br>sur<br>bed<br>4. 100<br>ad<br>5. Gri                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ecast c<br>dergrou<br>ntional<br>nholes<br>rface a<br>pply pe<br>d.<br>O% use<br>vantage | nd eff<br>leach<br>in roo<br>ir ven<br>rmit a<br>of lea<br>s.<br>low on | luent o<br>ing fie<br>f for i<br>ts to t<br>erobic<br>ching i | disposal<br>elds.<br>inspectio<br>the chamb<br>environm<br>infiltrat | cavern; i<br>n/service<br>ers for a<br>ent and r<br>ion botto | erlocking<br>ntended to<br>ir circula<br>esting/dry<br>m area; sh<br>es collect | replace<br>tion and<br>ing out o<br>ock load | 50m-                                            | cavern<br>2. Sewage<br>reducin<br>3. Effluen<br>filter.                                                          | e chambers<br>18" deep.<br>tank efflu<br>g pit.<br>t flows ov                           | interlock ta<br>ent piped (gr<br>er surface às<br>tes soil unde                                | ravity flow)<br>with an in                   | to velocity<br>termittent s  |
| MODEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                          | DIME NO                                                                 | IONE                                                          |                                                                      | BATED                                                         | TANK                                                                            | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~      | STS (DOL                                        | LARS                                                                                                             | DESIGN                                                                                  |                                                                                                |                                              |                              |
| NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | LENGTH                                                                                   | -                                                                       | H HEIG                                                        | WEIGH                                                                | CAPACIT<br>(GPD)                                              |                                                                                 | SUGG. LIST<br>(FOS<br>FACTORY)               | INSTAL                                          |                                                                                                                  |                                                                                         | ELECTRICITY<br>(RATING)                                                                        |                                              | OPERATING<br>SUPPLIES        |
| Std.<br>Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 13'                                                                                      | 43"                                                                     | 18                                                            | 1" 3500                                                              | Sized b<br>demand                                             | У                                                                               | 1.70/<br>sq.ft.                              | 0.20/<br>sq.f                                   | 0.20/                                                                                                            |                                                                                         | None                                                                                           |                                              | Effluent                     |
| H-20<br>Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                          | 45 <u>3</u>                                                             |                                                               |                                                                      | -                                                             |                                                                                 | 2.10/<br>sq.ft.                              | "                                               | -                                                                                                                |                                                                                         | "                                                                                              |                                              |                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                          | 1                                                                       |                                                               |                                                                      | 1                                                             | 1                                                                               |                                              |                                                 |                                                                                                                  |                                                                                         |                                                                                                |                                              |                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                          |                                                                         |                                                               |                                                                      | 1                                                             |                                                                                 |                                              |                                                 |                                                                                                                  |                                                                                         |                                                                                                |                                              |                              |
| COSTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                          |                                                                         |                                                               |                                                                      |                                                               |                                                                                 |                                              |                                                 | 3. Sand be                                                                                                       | g) require<br>d at least<br><b>&amp; MAINTE</b>                                         | . 30" below ar                                                                                 | rade @ 1 foo<br>JIREMENTS                    | ads (to prev<br>t cover requ |
| 1. Li:<br>(mi<br>2. In:<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | terial<br>stallat<br>(R = 1                                                              | costs<br>ion an<br>INICAL I<br>N REDUI                                  | ).<br>d deliv<br>PERFORM<br>CTION, A                          | AANCE OUTI<br>- ACTUAL V                                             | s vary.                                                       | OPERATIO<br>RANGES                                                              | HG N                                         | ion<br>Dise                                     | 3. Sand be<br><b>PERATION</b><br>1. Bed can<br>velocit<br>2. Occasio<br>3. Chamber<br>STANDARDS                  | d at least<br><b>&amp; MAINTE</b><br>be cleane<br>y pit can<br>nal inspec<br>s are inte | 30" below gr<br>NANCE RECU<br>d and scraped<br>be pumped out<br>tion of bed m<br>rlocked to pr | JIREMENTS<br>d through ma<br>t.<br>nanholes. | t cover requ<br>nholes for r |
| (ma<br>2. In:<br>MODEL<br>NUMBER<br>(MAJOR)<br>Std.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | terial<br>stallat<br>(R = 1<br>BOD <sub>B</sub>                                          | costs<br>ion an<br>INICAL I<br>& REDUI<br>SS                            | ).<br>d deliv<br>PERFORM<br>CTION, A<br>DD                    | AANCE OUTS<br>- ACTUAL V<br>COD                                      | s vary.                                                       | OPERATII<br>RANGES<br>(TEMP, OTH<br>Subsurtac                                   | ERI O                                        | ion<br>Dise<br>Sorias                           | 3. Sand be<br><b>OPERATION</b><br>1. Bed can<br>velocit<br>2. Occasio<br>3. Chamber<br>STANDARE<br>CODES MET     | d at least<br><b>&amp; MAINTE</b><br>be cleane<br>y pit can<br>nal inspec<br>s are inte | .30" below gr<br>NANCE REOL<br>d and scraped<br>be pumped out<br>tion of bed m                 | JIREMENTS<br>d through ma<br>t.<br>nanholes. | t cover requ<br>nholes for r |
| 1. L1:<br>(mailed for the second | terial<br>stallat<br>(R = 1                                                              | costs<br>ion an<br>INICAL I<br>N REDUI                                  | ).<br>d deliv<br>PERFORM<br>CTION, A                          | AANCE OUTI<br>- ACTUAL V                                             | s vary.                                                       | OPERATII<br>RANGES<br>(TEMP, OTH                                                | ecan<br>eani ou<br>soithif P                 | Dise<br>a<br>porse<br>poors<br>poor,<br>rop 1 v | 3. Sand be<br><b>PERATION</b><br>1. Bed can<br>velocit<br>2. Occasio<br>3. Chamber<br>STANDARDS                  | d at least<br><b>&amp; MAINTE</b><br>be cleane<br>y pit can<br>nal inspec<br>s are inte | .30" below gr<br>NANCE REOL<br>d and scraped<br>be pumped out<br>tion of bed m                 | JIREMENTS<br>d through ma<br>t.<br>nanholes. | t cover requ<br>nholes for r |
| 1. Lis<br>(ma<br>2. Ins<br>MODEL<br>NUMBER<br>(MAJOR)<br>Std.<br>Module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | terial<br>stallat<br>(R = 1<br>BOD <sub>B</sub>                                          | costs<br>ion an<br>INICAL I<br>& REDUI<br>SS                            | ).<br>d deliv<br>PERFORM<br>CTION, A<br>DO<br>NA              | AANCE OUTS<br>- ACTUAL V<br>COD                                      | s vary.                                                       | OPERATIN<br>RANGES<br>(TEMP, OTH<br>Subsurfac<br>extensive<br>applicati         | ecan No<br>Eani Ou<br>so îNa f P             | Dise<br>a<br>porse<br>poors<br>poor,<br>rop 1 v | 3. Sand be<br>PERATION<br>1. Bed can<br>velocit<br>2. Occasio<br>3. Chamber<br>STANDARD<br>CODES MET<br>Patented | d at least<br><b>&amp; MAINTE</b><br>be cleane<br>y pit can<br>nal inspec<br>s are inte | .30" below gr<br>NANCE REOL<br>d and scraped<br>be pumped out<br>tion of bed m                 | JIREMENTS<br>d through ma<br>t.<br>nanholes. | t cover requ<br>nholes for r |

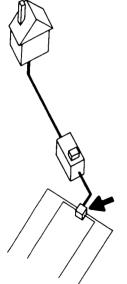


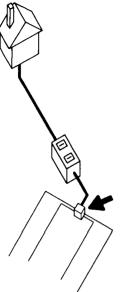
| FEATU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                              |                                                                                                                                                                                      |                                                                                              |                                                                             |                                                                                                   | bre Pipe Sali                                                                                                                    |                                                                               |                                                         | OPERATION                                                                                                                       |                                                                                             |                                                                | PERFORA                                                                    | TED)                                                                             |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------|-------------|
| 1. RC<br>2. US<br>56<br>3. Pe<br>4. In<br>70<br>5. Di<br>12<br>13<br>14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | und pip<br>ed for<br>ptic ta<br>wers, a<br>rforate<br>eet).<br>ert mat<br>ot-resi<br>fferent<br>rger ha<br>stribut<br>upling | convey<br>ink and<br>ind com<br>d pipe<br>cerials<br>istant.<br>sized<br>is four<br>tion of<br>scaled                                                                                | ance o<br>leach<br>binati<br>used<br>, resi<br>diame<br>rows<br>efflu<br>by fr               | of sewag<br>ing fie<br>for lea<br>stant t<br>ters, s<br>of hole<br>int in a | and wat<br>d, betwe<br>eof.<br>hing fie<br>chemica<br>aller ha<br>, all in<br>isposal<br>eated co | wood fibre.<br>er between<br>en septic s<br>lds (discus<br>ls and dete<br>s two rows<br>bottom hal<br>field.<br>upling ring ring | ystems and<br>sed on thi<br>rioration<br>of holes,<br>f of pipe<br>s or other | s<br>and<br>for                                         | <ol> <li>Unperformation</li> <li>treatment</li> <li>Treated</li> <li>box or</li> <li>Accordination</li> <li>lines or</li> </ol> | ht tank.<br>and Settle<br>"tee" and<br>ng to area<br>f perforat                             | edeffluent<br>"wye" sprea<br>required f<br>ed pipe car         | leaves tan<br>aders.<br>for disposa                                        | m house to sep<br>k in pipe to d<br>l of effluent,<br>n slight slope<br>h holes. | istr<br>sev |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | I                                                                                                                            | DIMENS                                                                                                                                                                               |                                                                                              | - Joini                                                                     | <u>,</u>                                                                                          |                                                                                                                                  |                                                                               |                                                         |                                                                                                                                 |                                                                                             |                                                                | REQUIREMENT                                                                |                                                                                  | Т           |
| MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | LENOT                                                                                                                        | -1                                                                                                                                                                                   | - <u> </u>                                                                                   | GHT (LE                                                                     |                                                                                                   | TY CAPACITY                                                                                                                      | SUGG. LIST<br>(FOB<br>FACTORY)                                                |                                                         | LL OPERATE                                                                                                                      | DESIGN<br>LIFETIME<br>(YRS.)                                                                | ELECTRICIT<br>(RATING)                                         |                                                                            | OPERATIN                                                                         |             |
| 4"<br>Type E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8'                                                                                                                           | 4"                                                                                                                                                                                   | rpuno                                                                                        | 2.0<br>16/                                                                  | t NA                                                                                              | NA                                                                                                                               |                                                                               |                                                         |                                                                                                                                 |                                                                                             | NA                                                             |                                                                            | Influent<br>or<br>Effluent                                                       |             |
| 4"<br>Type (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                              |                                                                                                                                                                                      | "                                                                                            | 2.6<br>1b/                                                                  | t "                                                                                               |                                                                                                                                  |                                                                               |                                                         |                                                                                                                                 |                                                                                             |                                                                |                                                                            |                                                                                  |             |
| 6"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 5'-8                                                                                                                         | 6"                                                                                                                                                                                   | round                                                                                        | 5.4<br>15/                                                                  | t "                                                                                               | "                                                                                                                                | ļ                                                                             | <br>                                                    |                                                                                                                                 |                                                                                             |                                                                |                                                                            |                                                                                  | $\perp$     |
| SIZING<br>1. La<br>2. Up<br>4<br>3. Di                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>&amp; GRO</b><br>rger ar<br>to 4"<br>rows of                                                                              | WTHP<br>d smal<br>diamet<br>perfo<br>lengt                                                                                                                                           | OTEN<br>ler di<br>er - 2<br>ration<br>hs and                                                 | TIAL<br>ameters<br>rows o<br>us.<br>I multip                                |                                                                                                   |                                                                                                                                  |                                                                               |                                                         | applica                                                                                                                         | and draina<br>tion.                                                                         | ge bed sys1                                                    |                                                                            | wage hook-up                                                                     |             |
| 1,<br>SIZING<br>1. La<br>2. Up<br>4<br>3. 01<br>ac<br>costs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>&amp; GRO</b><br>rger ar<br>to 4"<br>rows of<br>fferent                                                                   | WTHP<br>d smal<br>diamet<br>perfo<br>lengt<br>ies ava                                                                                                                                | OTEN<br>ler di<br>er - 2<br>ration<br>hs and<br>ilable                                       | TIAL<br>ameters<br>rows o<br>is.<br>I multip                                | availab)<br>perfora                                                                               | 2.<br>Lions; 5"                                                                                                                  |                                                                               |                                                         | 1. Trench                                                                                                                       | and draina<br>tion.                                                                         | ge bed sys1                                                    |                                                                            |                                                                                  |             |
| 1, Ld<br>1, Ld<br>2, Uy<br>4<br>3, D1<br>COSTS<br>1, 1<br>MODEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | & GRO<br>rger ar<br>to 4"<br>rows of<br>fferent<br>cessor:<br>riced of<br>riced of                                           | WTH P<br>d smal<br>diamet<br>perfo<br>lengt<br>ies ava<br>competi<br>HNICAL                                                                                                          | OTEN<br>ler di<br>er - 2<br>ration<br>hs and<br>ilable<br>tivel;                             | TIAL<br>ameters<br>2 rows o<br>is.<br>1 multip<br>4.                        | availabi<br>perfora<br>e coupli                                                                   | 2.<br>tions; 5"<br>ng and rout<br>OPERATI<br>RANGE                                                                               | ing<br>Na N                                                                   | NOISE &                                                 | 1. Trench applica                                                                                                               | and draina<br>tion.<br>& MAINTE                                                             | ge bed syst                                                    | QUIREMEN                                                                   | AVERAGE FLOW                                                                     | , 250       |
| 1<br>SIZING<br>1. Le<br>2. Up<br>4<br>3. Di<br>ac<br>COSTS<br>1. 1<br>MODEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | & GRO<br>rger ar<br>to 4"<br>rows of<br>fferent<br>cessor:<br>riced of                                                       | WTH P<br>d smal<br>diamet<br>perfo<br>lengt<br>es ava<br>competi                                                                                                                     | OTEN<br>ler di<br>er - 2<br>ration<br>hs and<br>ilable<br>tivel;                             | TIAL<br>ameters<br>rows o<br>is.<br>imultip<br>t.                           | availabi<br>perfora<br>e coupli                                                                   | e.<br>tions; 5"<br>ng and rout                                                                                                   | ing<br>NG N<br>HER) G<br>if p                                                 | Koise<br>a<br>books<br>odors,<br>rrop'ly                | 1. Trench applica                                                                                                               | and draina<br>tion.<br>& MAINTE<br>PERFO<br>ROWS;<br>0 2:3                                  | ge bed syst                                                    | QUIREMEN                                                                   | AVERAGE FLOW                                                                     | , 250       |
| I, La<br>SIZING<br>1. La<br>2. UU<br>4<br>3. DI<br>COSTS<br>1. 1<br>MODEL<br>NUMBER<br>(MAJORI)<br>4"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | & GRO<br>rger ar<br>to 4"<br>rows of<br>fferent<br>cessor:<br>riced of<br>riced of<br>BOO <sub>B</sub><br>NA                 | WTH P<br>d smal<br>diamet<br>perfo<br>lengt<br>es ava<br>competi<br>NNICAL I<br>S REDU<br>SS                                                                                         | OTEN<br>ler di<br>er - 2<br>ration<br>hs and<br>ilable<br>tivel;<br>ERFOR<br>CTION, 7        | TIAL<br>ameters<br>rows o<br>s.<br>multip                                   | availabi<br>perfora<br>e coupli                                                                   | 2.<br>tions; 5"<br>ng and rout<br>OPERATI<br>RANGE                                                                               | ing<br>NG N<br>HER) G<br>if p                                                 | NOISE<br>B<br>NOORS<br>Odors,<br>prop'ly<br>alled       | 1. Trench<br>applica OPERATION STANDARDS CODES MET ASTM, AASHI                                                                  | and draina<br>tion.<br>& MAINTE<br>PERFO<br>ROWS;<br>0 2:3                                  | ge bed syst<br>NANCE RE<br>RATIONS (<br>SPACING 36<br>" at 90° | QUIREMEN<br>RUSHING<br>STRENGTH<br>° BEARING <sup>2</sup>                  | AVERAGE FLOH<br>"N" (GA                                                          | с/иг        |
| )<br>SIZING<br>1. L2<br>2. Up<br>3. 0<br>COSTS<br>1. 1<br>морец<br>морец<br>морец<br>морец<br>4"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | a GRO<br>rger ar<br>rows of<br>fferent<br>cessor:<br>riced of<br>riced of<br>NA                                              | WTH P<br>d smal<br>diamet<br>perfo<br>lengt<br>es ava<br>competi<br>NNICAL I<br>S REDU<br>SS                                                                                         | OTEN<br>ler di<br>er - 2<br>ration<br>hs and<br>ilable<br>tivel;<br>PERFOR<br>CTION, 7<br>DO | TIAL<br>ameters<br>2 rows o<br>is.<br>1 multip                              | availabi<br>perfora<br>e coupli                                                                   | 2.<br>tions; 5"<br>ng and rout<br>OPERATI<br>RANGE                                                                               | ing<br>NG N<br>HER) G<br>if p<br>inst                                         | KOISE<br>& HOORS<br>ODORS<br>Odors,<br>rrop'ly<br>alled | 1. Trench<br>applica OPERATION STANDARDS CODES MET ASTM, AASHI                                                                  | And draina<br>tion.<br>A MAINTE<br>PERFO<br>ROWS;<br>1 2;3                                  | RATIONS (<br>SPACING 36<br>" at 90°                            | QUIREMEN<br>CRUSHING<br>STRENGTH<br>9° BEARING <sup>2</sup><br>4300        | AVERACE FLON<br>1%<br>0.011                                                      | 93          |
| 1,           1,           2.           1,           2.           1,           3.           0           COSTS           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1.           1. | <b>a</b> GRO<br>rger ar<br>to 4"<br>fferent<br>cessor:<br>riced of<br>NA<br>                                                 | WTHP<br>d smal<br>perfc<br>i lengt<br>: lengt<br>:s ava<br>:compet1<br>:s rebu<br>:s<br>NA<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>:<br>: | OTEN<br>ler d<br>er - 2<br>ration<br>hs and<br>ilable<br>tivel;<br>DO<br>NA<br>              | TIAL<br>ameters<br>rows o<br>is.<br>imultip                                 | availabl<br>perfora<br>e coupli                                                                   | 2.<br>Lions; 5"<br>ng and rout<br>RAMOG<br>(TEMP, OT                                                                             | ing<br>NG N<br>S<br>HER) C<br>Tr<br>if p<br>inst<br>                          | Noise<br>abooms<br>odors,<br>alled                      | 1. Trench applica<br>OPERATION<br>STANDARDS<br>CODES MET<br>ASTM, AASH<br>and Federa                                            | And draina<br>tion.<br>A MAINTE<br>PERFO<br>ROWS;<br>0<br>1 2;<br>3<br>2;<br>4;<br>4;<br>.; | RATIONS (<br>SPACING 360<br>" at 90°<br>-<br>"                 | QUIREMEN<br>CRUSHING<br>TRENGTH<br>9° BEARING <sup>2</sup><br>4300<br>5300 | NTS<br>AVERACE FLON<br>1%<br>(GA<br>0.011<br>"                                   | 93<br>93    |

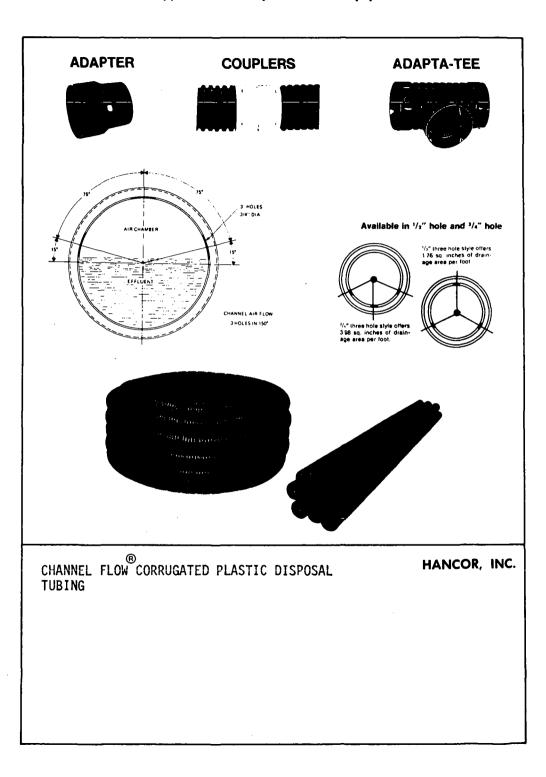




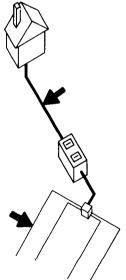
| FEATU                                                                                           | RES                                             |                                                            |                                                                |                                                    | h, President                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                    | PERATION                                                                            |                                                                            | I                                                                                              | DOSING V                                          | · · ·      |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------|------------|
| swi<br>two<br>2. Two<br>acc                                                                     | itched<br>leach<br>teles<br>cess to             | to per<br>ing fi<br>coping<br>switc                        | mit se<br>elds.<br>section<br>h with                           | otic-tan<br>ons come<br>long T-                    | ainless sto<br>k effluent<br>to the gro<br>bar.<br>ow operatio | to flow i<br>bund with                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | n either                           | of:                | leachin<br>2. Once a<br>cover a<br>of sewa<br>recuper                               | g fields.<br>year owner<br>nd inserti<br>ge water,<br>ation from           | as one connec<br>is notified<br>ng T-bar to t<br>to "dose" fie<br>anaerobic sl<br>or recording | to switch v<br>urn switch,<br>lds and all<br>ime. | alve by op |
|                                                                                                 | r                                               | DIMENS                                                     |                                                                |                                                    | <del></del>                                                    | <b>.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ~~~~~                              | STSIDOLL           |                                                                                     | <u> </u>                                                                   | T                                                                                              | OUIREMENTS                                        | <u> </u>   |
| NODEL<br>NUMBER<br>(MAJOR)                                                                      |                                                 | 1                                                          |                                                                | WEIG                                               | CAPACITI                                                       | CAPACITY<br>(GAL.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | SUGG. LIST                         | INSTALL            | OPERATE                                                                             | DESIGN<br>LIFETIME<br>(YRS.)                                               | ELECTRICITY                                                                                    |                                                   |            |
| DV03<br>Gravity                                                                                 | <u> </u>                                        | rpund                                                      | 8                                                              |                                                    | 1                                                              | NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (FOB 2<br>FACTORY)<br>\$85.        | See<br>Costs       | None                                                                                | 50                                                                         | (RATING)                                                                                       |                                                   |            |
| Flow<br>DV04<br>Pres-<br>surized                                                                |                                                 | $\uparrow$                                                 |                                                                |                                                    |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | \$97.                              | Below.             | -                                                                                   |                                                                            |                                                                                                |                                                   |            |
| 3011220                                                                                         |                                                 |                                                            |                                                                |                                                    |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                    |                                                                                     |                                                                            |                                                                                                |                                                   |            |
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| 2. 3"<br>COSTS                                                                                  |                                                 |                                                            |                                                                |                                                    | for primary                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ons.                               | or                 | and no<br>2. Unskill<br>3. Up to 4<br>PERATION                                      | leveling.<br>ed labor a<br>B" depth a<br><b>&amp; MAINT!</b>               |                                                                                                | or installat<br>UIREMENTS                         |            |
| 2. 3"<br>COSTS<br>1. Pre<br>typ                                                                 | essuriz<br>be of c                              | ed uni<br>onnect<br>HNICAL                                 | t cost<br>ing pij<br>PERFOR                                    | include                                            | for primary<br>s molded-in                                     | operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ons.<br>for any                    | OF<br>1.           | and no<br>2. Unskill<br>3. Up to 4<br>PERATION<br>Once a y                          | leveling.<br>ed labor a<br>B" depth a<br><b>&amp; MAINTE</b><br>ear switch | ppropriate fo<br>llowed.                                                                       | or installat<br>UIREMENTS                         |            |
| 2. 3"<br>COSTS<br>I. Pre<br>typ                                                                 | essuriz<br>be of c                              | ed uni<br>onnect<br>HNICAL                                 | t cost<br>ing pij<br>PERFOR                                    | include<br>e.                                      | for primary<br>s molded-in                                     | OPERATI<br>RANGE<br>(TEMP, OT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ons.<br>for any<br>NG N<br>4ERI C  | 0F<br>1.           | and no<br>2. Unskill<br>3. Up to 4:<br>PERATION<br>Once a y                         | leveling.<br>ed labor a<br>B" depth a<br><b>&amp; MAINTE</b><br>ear switch | ppropriate fo<br>llowed.<br>ENANCE RECN                                                        | or installat<br>UIREMENTS                         |            |
| 2. 3"<br>COSTS<br>T. Pre<br>typ                                                                 | essuriz<br>De of C<br>TEC<br>(R +               | ed uni<br>onnect<br>HNICAL                                 | t cost<br>ing pij<br>PERFORI<br>CTION, A                       | include<br>e.<br>AANCE-OU<br>- ACTUAI              | for primary<br>s molded-in                                     | OPERATI<br>RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ons.<br>for any<br>NG N<br>4ERI C  | OF<br>1.           | and no<br>2. Unskill<br>3. Up to 4<br>PERATION<br>Once a y<br>STANDARD              | leveling.<br>ed labor a<br>B" depth a<br><b>&amp; MAINTE</b><br>ear switch | ppropriate fo<br>llowed.<br>ENANCE RECN                                                        | or installat<br>UIREMENTS                         |            |
| 2. 3"<br>COSTS<br>T. Pre<br>typ<br>MODEL<br>NUMBER<br>(MAJOR)                                   | TECI<br>TECI<br>(R -<br>BOD <sub>8</sub>        | ed uni<br>onnect<br>HNICAL<br>S REDU                       | t cost<br>ing pij<br>PERFORI<br>CTION, A                       | include<br>le.<br>AANCE-OU<br>ACTUAT               | for primary<br>s molded-in                                     | operan<br>RANGE<br>(TEMP, OT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ons.<br>for any<br>NG N<br>4ERI C  | OF<br>1.           | and no<br>2. Unskill<br>3. Up to 4<br>PERATION<br>Once a y<br>STANDARD              | leveling.<br>ed labor a<br>B" depth a<br><b>&amp; MAINTE</b><br>ear switch | ppropriate fo<br>llowed.<br>ENANCE RECN                                                        | or installat<br>UIREMENTS                         |            |
| 2. 3"<br>COSTS<br>T. Pre<br>typ<br>MODEL<br>NUMBER<br>(MAJOR)                                   | TECI<br>TECI<br>(R -<br>BOD <sub>8</sub>        | ed uni<br>onnect<br>HNICAL<br>S REDU                       | t cost<br>ing pij<br>PERFORI<br>CTION, A                       | include<br>le.<br>AANCE-OU<br>ACTUAT               | for primary<br>s molded-in                                     | operan<br>RANGE<br>(TEMP, OT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ons.<br>for any<br>NG N<br>4ERI C  | OF<br>1.           | and no<br>2. Unskill<br>3. Up to 4<br>PERATION<br>Once a y<br>STANDARD              | leveling.<br>ed labor a<br>B" depth a<br><b>&amp; MAINTE</b><br>ear switch | ppropriate fo<br>llowed.<br>ENANCE RECN                                                        | or installat<br>UIREMENTS                         |            |
| 2. 3"<br>COSTS<br>1. Pre<br>typ<br>NUMBER<br>(MAJOR)<br>Both                                    | TEC:<br>NA                                      | ed uni<br>onnect<br>% RCBU<br>\$8                          | t cost<br>ing pij<br>PERFORI<br>NA                             | AANCE-OU<br>AANCE-OU<br>ACTUAL<br>NA               | for primary<br>s molded-in<br>trut<br>value:                   | operan<br>RANGE<br>(TEMP, OT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ons.<br>for any<br>NG N<br>4ERI C  | OF<br>1.           | and no<br>2. Unskill<br>3. Up to 4:<br>FERATION<br>Once a y<br>STANDARD<br>CODESMET | leveling.<br>ed labor a<br>8" depth a<br>8 MAINTE<br>ear switch            | ppropriate fo<br>llowed.<br>INANCE REOU<br>Ing of valve.                                       | or installat<br>UIREMENTS                         |            |
| 2. 3"<br>COSTS<br>1. Pre<br>typ<br>MODEL<br>NUMBER<br>IMAJORI<br>Both<br>WARRA<br>1. Onc<br>val | TECI<br>(R -<br>BOOG<br>NA<br>NTIES,<br>e a ye. | ed uni<br>onnect<br>% REDU<br>\$\$<br>NA<br>GUAR<br>ar, fo | t cost<br>ing pij<br>PERFORM,A<br>DO<br>NA<br>ANTEE<br>r 10 yd | include<br>e.<br>- ACTUAN<br>COD<br>NA<br>S, & SER | for primary<br>s molded-in<br>trut<br>value:                   | <pre>/ connecti<br/>fittings<br/>// connection<br/>// co</pre> | for any NG N KENI G O F AIII to sw | OF<br>DORS<br>DORS | and no<br>2. Unskill<br>3. Up to 4:<br>FERATION<br>Once a y<br>STANDARD<br>CODESMET | leveling.<br>ed labor a<br>B" depth a<br><b>&amp; MAINTE</b><br>ear switch | ppropriate fo<br>llowed.<br>INANCE REOU<br>Ing of valve.                                       | or installat<br>UIREMENTS                         |            |

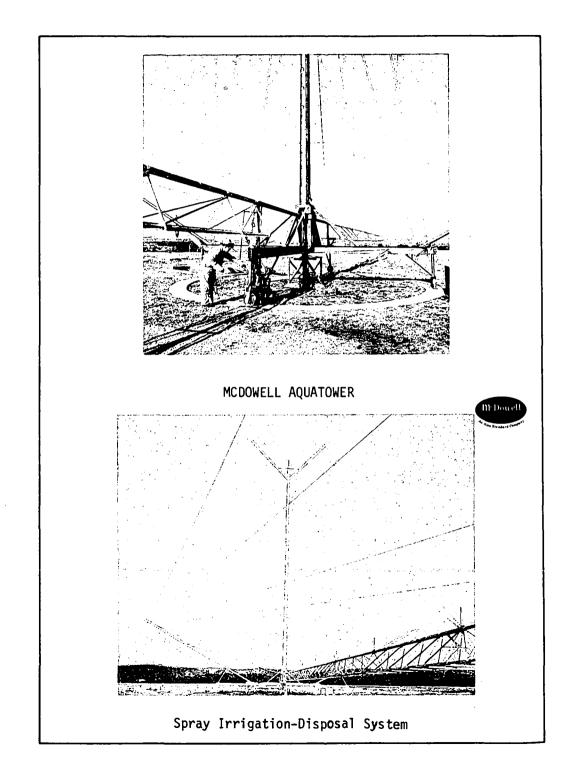






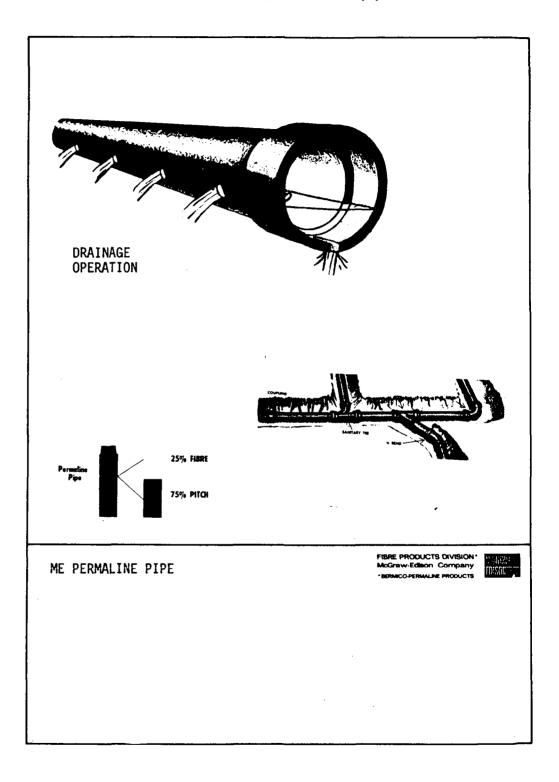
| P.<br>Fi                                                                                                                        | 19) 42                                                                                                       | K 1047<br>Y, OHI<br>2-8521                                                     | 0 4584                                                                                   |                                                                         | uality Contr                                                                                              | rol Departm                                                     | <b>le</b> nt                                                                                                     |                                                                        |                                                                                                                                                       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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | C DISPOSAL                                                                                                                                                       |      |
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| in<br>2. 1/<br>fo<br>3. Co<br>3. Co<br>st<br>4. Ca<br>ev<br>5. 2"                                                               | gh dens<br>long r<br>2" thre<br>ot; 3/4<br>e per f<br>rrugate<br>rength<br>n be ir<br>en díst<br>ID "Tu      | olls f<br>e-hold<br>boot.<br>d ring<br>of pla<br>stalle<br>ributi              | for lead<br>style<br>e-hole<br>is to mi<br>istic st<br>d "flow<br>on.<br>www.used        | hing f<br>(9/ft.<br>style<br>nimize<br>yle.<br>-down"                   | exible per<br>ields.<br>) has 1.76<br>(9/ft.) ha<br>• thickness<br>or in inv<br>ir conveya<br>• foot roll | sq. in. o<br>s 3.98 sq.<br>(weight)<br>erted flow<br>nce; 7'/lb | f draina<br>in of d<br>and maxi<br>positic                                                                       | ilable<br>ge per<br>rain-<br>mize<br>n for                             | trench.<br>2. Pipes b<br>3. Recomme<br>pressur<br>4. "Turf-F                                                                                                                                                              | ter flows<br>end with m<br>nded opera<br>e.<br>low" tubin                                                                                      | into pipe and<br>ovement of en<br>tion with gra<br>g can be used<br>ge page 65.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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       | rnal |
| MODEL                                                                                                                           | 1                                                                                                            | OIMENS                                                                         | -                                                                                        |                                                                         | RATED                                                                                                     | TANK                                                            | T                                                                                                                | COSTS (DOL                                                             | LARS                                                                                                                                                                                                                      | DESIGN                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <u> </u>                                                                                                                                                         | 1    |
| NUMBER<br>(MAJOR)                                                                                                               | LENGT                                                                                                        | WIDT                                                                           | HEIG                                                                                     | HT (LS                                                                  | CARACIT                                                                                                   | CAPACITY                                                        | SUGG. LI<br>(FOB<br>FACTOR                                                                                       |                                                                        |                                                                                                                                                                                                                           | LIFETIME<br>(YRS.)                                                                                                                             | ELECTRICITY<br>(RATING)                                                                                                                                                                                                                                                                                                                                                                                                                                               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                                                                               | OPERATING<br>SUPPLIES                                                                                                                                            |      |
| 4"<br>Channel<br>Flow                                                                                                           | 10'<br>and<br>225'                                                                                           | 4"                                                                             | round                                                                                    | 225<br>(4"<br>78                                                        |                                                                                                           | KA                                                              | Varie                                                                                                            |                                                                        | None <sup>1</sup>                                                                                                                                                                                                         |                                                                                                                                                | NA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Water and<br>Effluent                                                                                                                                            |      |
|                                                                                                                                 |                                                                                                              |                                                                                |                                                                                          | _                                                                       |                                                                                                           |                                                                 | <b> </b>                                                                                                         |                                                                        | -                                                                                                                                                     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|                                                                                                                                 |                                                                                                              | <u> </u>                                                                       | 1                                                                                        |                                                                         |                                                                                                           | 1                                                               | I                                                                                                                | 1                                                                      | <sup>1</sup> If proper                                                                                                                                                                                                    | lv install                                                                                                                                     | ed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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| 1. Ad<br>2. Co<br>co                                                                                                            | apters<br>uplings<br>uplings                                                                                 | for tu<br>, bend                                                               | ibe to p<br>is, etc.                                                                     | ipe or<br>, avai                                                        | tile avai<br>lable; ben                                                                                   | ds have se                                                      | lf-conta                                                                                                         | ined                                                                   | crushed<br>maximum<br><b>PERATION</b>                                                                                                                                                                                     | installed<br>gravel -<br>strength.                                                                                                             | under proper<br>2 Inches belo<br>NANCE REQU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| 2. Co<br>co<br><b>COSTS</b><br>1. Ad                                                                                            | apters<br>uplings<br>uplings<br>apters<br>riced o                                                            | for tu<br>, benc<br>availa<br>competi                                          | be to p<br>is, etc.<br>bble at<br>tively.                                                | additi                                                                  | lable; ben<br>onal cost.                                                                                  | ds have se                                                      | lf-conta                                                                                                         | ined                                                                   | <ol> <li>Must be<br/>crushed<br/>maximum</li> <li>PERATION</li> </ol>                                                                                                                                                     | installed<br>gravel -<br>strength.                                                                                                             | under proper<br>2 inches belo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | hes above fo                                                                                                                                                     | r    |
| 1. Ad<br>2. Co<br>co<br><b>COSTS</b><br>1. Ad                                                                                   | apters<br>uplings<br>uplings<br>apters<br>riced c                                                            | for tu<br>, bend<br>availa<br>competi                                          | be to p<br>is, etc.<br>bble at<br>tively.                                                | additi                                                                  | lable; ben<br>onal cost.                                                                                  | ds have se                                                      | ING<br>S                                                                                                         | ined                                                                   | <ol> <li>Must be<br/>crushed<br/>maximum</li> <li>PERATION</li> </ol>                                                                                                                                                     | installed<br>gravel -<br>strength.<br>& MAINTE<br>d for unde                                                                                   | under proper<br>2 Inches belo<br>NANCE REQU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | hes above fo                                                                                                                                                     | r    |
| 1. Ad<br>2. Co<br>co<br>COSTS<br>1. Ad<br>2. P                                                                                  | apters<br>uplings<br>uplings<br>apters<br>riced of                                                           | for tu<br>, benc<br>availa<br>competi<br>NNICAL<br>X REDU                      | be to p<br>is, etc.<br>ble at<br>tively.                                                 | additi                                                                  | lable; ben<br>onal cost.                                                                                  | OPERAT<br>RANGE                                                 | ING<br>IS<br>HERI<br>DI                                                                                          | Noise                                                                  | <ol> <li>Must be<br/>crushed<br/>maximum</li> <li>MPERATION</li> <li>Designe</li> <li>STANDARDA</li> </ol>                                                                                                                | installed<br>gravel -<br>strength.<br>& MAINTE<br>d for unde<br>PEF<br>ROW                                                                     | under proper<br>2 inches belo<br>NANCE REQU<br>rground water                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WW and 8 incl<br>JIREMENTS<br>- and sewage<br>E SPACING<br>4" at 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| 1. Ad<br>2. Co<br>co<br>COSTS<br>1. Ad<br>2. P<br>MODEL<br>MADER<br>(MAJOR)<br>4"<br>Channel                                    | apters<br>uplings<br>uplings<br>apters<br>riced c<br>(R =<br>800 <sub>5</sub>                                | for tu<br>, benc<br>availa<br>competi<br>NNICAL<br>% REDU                      | be to p<br>is, etc.<br>bble at<br>tively.<br>PERFORM<br>CTION, A<br>DO                   | additi                                                                  | lable; ben<br>onal cost.                                                                                  | OPERAT<br>RANGE                                                 | ING<br>IS<br>HERI<br>DI                                                                                          | Norse<br>b<br>coors<br>codor if<br>coperly                             | 1. Must be<br>crushed<br>maximum<br>PERATION<br>1. Designe<br>STANDARDA<br>CODES MET                                                                                                                                      | installed<br>gravel -<br>strength.<br>& MAINTE<br>d for unde<br>PEF<br>ROW                                                                     | under proper<br>2 inches belo<br>NANCE REQU<br>rground water<br>FORATIONS<br>IS HOLE SIZE<br>3/4"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WW and 8 incl<br>JIREMENTS<br>- and sewage<br>E SPACING<br>4" at 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | • and 120°                                                                                                                                                       | r    |
| 1. Ad<br>2. Co<br>co<br>COSTS<br>1. Ad<br>2. P<br>MODEL<br>NUMBER<br>(MAJORI<br>4"<br>Channel                                   | apters<br>uplings<br>uplings<br>apters<br>riced c<br>(R =<br>800 <sub>5</sub>                                | for tu<br>, benc<br>availa<br>competi<br>NNICAL<br>% REDU                      | be to p<br>is, etc.<br>bble at<br>tively.<br>PERFORM<br>CTION, A<br>DO                   | additi                                                                  | lable; ben<br>onal cost.                                                                                  | OPERAT<br>RANGE                                                 | ING<br>IS<br>HERI<br>DI                                                                                          | Norse<br>b<br>coors<br>codor if<br>coperly                             | 1. Must be<br>crushed<br>maximum<br>PERATION<br>1. Designe<br>STANDARDA<br>CODES MET<br>CS 228-61<br>ASTM D1248                                                                                                           | installed<br>gravel -<br>strength.<br>& MAINTE<br>d for unde<br>R PEF<br>ROW<br>2 3<br>3<br>Crade 4,                                           | under proper<br>2 inches belo<br>NANCE REQU<br>rground water<br>FORATIONS<br>IS 'HOLE SIZE<br>3/4"<br>1/2"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | IREMENTS<br>and sewage<br>SPACING<br>4" at 60<br>4" at 60<br>ethylene,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | • and 120°                                                                                                                                                       | r    |
| 1. Ad<br>2. Co<br>COSTS<br>1. Ad<br>2. P<br>MODEL<br>NUMER<br>(MAJOR)<br>4"<br>Channel<br>Flow<br>WARRA<br>1. Ma<br>pc<br>2. In | apters<br>uplings<br>uplings<br>apters<br>riced c<br>rcc<br>(R -<br>soog<br>NA<br>NTIES,<br>terial<br>rforma | for tu<br>, benc<br><br>availa<br>competi<br>NA<br>S<br>GUAR<br>s guar<br>nce. | bibe to p<br>is, etc.<br>bible at<br>tively.<br>PERFORMA<br>NA<br>NA<br>ANTEE:<br>anteed | AMCE OL<br>Additi<br>ACTUA<br>COD<br>NA<br>S, & SE<br>For CS<br>ddtions | RVICE<br>228-61 (Cc<br>; and addit                                                                        | OPERAT<br>RANGE<br>(Treas, or                                   | ING<br>IS<br>MERJ<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I<br>I | Noise<br>a<br>a<br>a<br>a<br>a<br>a<br>a<br>a<br>a<br>a<br>a<br>a<br>a | 1. Must be<br>crushed<br>maximum<br>PPERATION<br>1. Designe<br>STANDARDA<br>CODES MET<br>CS 228-61<br>ASTM 01248<br>CCODES MET<br>CS 228-61<br>ASTM 01248<br>CODES MET<br>CS 228-61<br>ASTM 01248<br>COMMENTS<br>COMMENTS | installed<br>gravel -<br>strength.<br>& MAINTE<br>d for unde<br>for unde<br>c a<br>c a<br>c a<br>c a<br>c a<br>c a<br>c a<br>c a<br>c a<br>c a | under proper<br>2 inches belo<br>NANCE REQU<br>rground water<br>(FORATIONS<br>IS HOLE SIZE<br>3/4"<br>1/2"<br>Class C Polyc<br>al properties<br>ANCE<br>; FMA Material<br>sists for variable of smole of | W and 8 incl<br>UREMENTS<br>- and sewage<br>E SPACING<br>4" at 60<br>4" at 6 | <ul> <li>and 120°</li> <li>and 120°</li> <li>and 120°</li> <li>emical resigning pipe as water ter on water</li> <li>July 31, 14</li> <li>ations offei</li> </ul> |      |



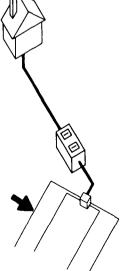


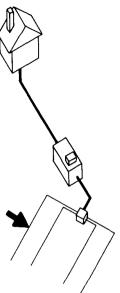
| P. C                                                                                                                   | ). BOX<br>BOIS, P<br>4) 371-                                                            | <b>66</b> 5<br>PA. 158<br>6550                                         | NUFAC1<br>101<br>. H. Parro                                                                    |                                                                                             |                                                                                           |                                                          |                                                                 |                                  |                                                                                                                                                                                                                     |                                                                                                                                                  |                                                                                                                                          | AQUAT                                                                                                    | TION,                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| res<br>gat<br>2. Wat<br>via<br>3. Opt<br>4. Wate                                                                       | ge modu<br>istent)<br>ion lir<br>er pres<br>hydrau<br>ional e                           | ) truss<br>hes for<br>ssure o<br>ilic mo<br>electri<br>hy rate         | booms s<br>dispose<br>of efflue<br>tor (35<br>ical driv<br>ranges                              | supporte<br>al of ef<br>ent shou<br>or 70 P<br>ve (1/3                                      | inum or ep<br>ed by cabl<br>ffluent.<br>ld supply<br>PSI models<br>XP) for l<br>27/9 hour | es carrie<br>energy t<br>).<br>ow-pressu                 | es spray i<br>to turn to<br>ure efflue                          | ion- 1<br>rri-<br>wer 2<br>nt. 3 | tower o<br>interva<br>of wast<br>2. Piping<br>3. Ground                                                                                                                                                             | ressure fr<br>n concrete<br>ls along t<br>ewater.<br>and coupli<br>clearance                                                                     | om effluent<br>track. Wat<br>wo booms to<br>ngs availabl<br>varied to su<br>vable of spra                                                | er is spraye<br>spray-irrige<br>e in aluminu<br>it terrain.                                              | ed at diffe<br>ite land an<br>um or PVC c                                                                  |
|                                                                                                                        |                                                                                         | MINENSIC                                                               |                                                                                                |                                                                                             |                                                                                           | ·                                                        |                                                                 |                                  |                                                                                                                                                                                                                     |                                                                                                                                                  |                                                                                                                                          | QUIREMENTS                                                                                               | <del></del>                                                                                                |
| MODEL<br>NUMBER<br>(MAJOR)                                                                                             | LENIGTH                                                                                 | WIOTH                                                                  | · 1 · · · · ·                                                                                  | WEIGHT                                                                                      | RATED<br>CAPACITY<br>(GPO)                                                                | TANK<br>CAPACITY<br>(GAL.)                               | SUGG. LIST                                                      | INSTALL                          |                                                                                                                                                                                                                     | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                                     | ELECTRICITY                                                                                                                              | EFFLUENT                                                                                                 |                                                                                                            |
| Aqua-<br>tower<br>1_acre                                                                                               | 2001                                                                                    | 2' to<br>30'                                                           |                                                                                                | 9000                                                                                        | 10,000<br>(1 acre)                                                                        | NA                                                       | \$ 6,000.                                                       | \$1,000<br>(varies)              | Minor                                                                                                                                                                                                               |                                                                                                                                                  | (RATING)<br>Optional<br>Equipment<br>115_V_AC                                                                                            | PRESSURE<br>35 or<br>70 PSI                                                                              | Effluent<br>hydrauli<br>fluid                                                                              |
|                                                                                                                        |                                                                                         |                                                                        |                                                                                                |                                                                                             |                                                                                           |                                                          |                                                                 |                                  |                                                                                                                                                                                                                     |                                                                                                                                                  |                                                                                                                                          |                                                                                                          |                                                                                                            |
|                                                                                                                        |                                                                                         |                                                                        |                                                                                                |                                                                                             |                                                                                           |                                                          |                                                                 |                                  |                                                                                                                                                                                                                     |                                                                                                                                                  |                                                                                                                                          |                                                                                                          |                                                                                                            |
| Aqua-<br>tower                                                                                                         |                                                                                         | 2' to                                                                  | 98'                                                                                            | 12000                                                                                       | 700,000                                                                                   |                                                          | \$13,000.                                                       | \$3,000.<br>(varies)             |                                                                                                                                                                                                                     |                                                                                                                                                  |                                                                                                                                          |                                                                                                          |                                                                                                            |
| SIZING 8<br>3. Modi<br>gat<br>add<br>COSTS<br>7. Cos<br>Mus                                                            | ular sy<br>ion dem<br>ing tru<br>ts vary<br>t be fa                                     | rstem c<br>nands<br>iss sec<br>r for i<br>ictory                       | DTENTIA<br>an be ac<br>over a v<br>tions ar                                                    | L<br>Japted t<br>vide ran<br>nd nozzl<br>tion sit                                           | te topogra<br>installed                                                                   | phy, loca<br>suppry, loca                                | and sizes<br>ation, sea                                         | son.                             | <ol> <li>Factory</li> <li>All equivided 10ad).</li> <li>Steel e</li> <li>ERATION</li> <li>Operatimust most most most most most most most mo</li></ol>                                                               | ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor syst                                                                      | butor instal<br>ack transport<br>ersonnel and<br>ENANCE REO<br>matic. Oper<br>tem for volum                                              | ed to site (<br>plumbing ski<br>UIREMENTS<br>ator (sewage<br>e, speed, ei                                | ills requir<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>;<br>; |
| SIZING 8<br>1. Modi<br>gat<br>add<br>COSTS<br>1. Cos<br>Mus                                                            | a GROM<br>ular sy<br>ion dem<br>ing tru<br>ts vary<br>t be fa<br>ional m                | YTH PC<br>rstem c<br>nands<br>uss sec<br>r for i<br>nctory             | DTENTIA<br>an be ac<br>over a v<br>tions ar                                                    | L<br>Japted t<br>vide ran<br>nd nozzl<br>tion sit                                           | to differenge of cap<br>les.<br>te topogra                                                | phy, loca<br>suppry, loca                                | and sizes<br>ation, sea                                         | rri- 1<br>by 2<br>3<br>son. 1    | <ol> <li>Factory</li> <li>All equival</li> <li>load).</li> <li>Steel e</li> <li>ERATION</li> <li>Operating</li> <li>Minor n</li> <li>Only \$2<br/>by unsk</li> </ol>                                                | or distri<br>ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor sysi<br>egular ser<br>00 worth o<br>illed labo               | butor instal<br>ack transport<br>ersonnel and<br><b>NANCE REQ</b><br>matic. Oper<br>em for volum<br>vvice: oiling<br>of replaceabl<br>r. | ed to site 4<br>plumbing sk<br>UIREMENTS<br>ator (sewage<br>e, speed, ei<br>, checking n<br>e moving par | ills requir<br>plant or<br>tc.<br>nozzles for<br>rts; can be                                               |
| SiZING 8<br>1. Modi<br>gat<br>add<br>COSTS<br>1. Cos<br>Mus<br>2. Opt<br>ext:<br>MODEL<br>NUMBER                       | ts vary<br>t be fa<br>ional m<br>ra.                                                    | vTH PC<br>rstem c<br>rands<br>iss sec<br>r for i<br>foctory<br>hotor d | DTENTIA<br>an be ac<br>over a v<br>tions ar<br>installat<br>or distri<br>infven ur<br>ERFORMAJ | Liapted t<br>side rar<br>nd nozzi<br>tion sit<br>ributor<br>nit for<br>NCE-OUTP<br>NCTUAL V | to differe<br>Nes of cap<br>les.<br>te topogra<br>installed<br>low-press                  | ophy, loca<br>/supervis<br>ure efflu<br>OPERATI<br>RANGE | nd sizes<br>ation, sea<br>sed.<br>Jent costs                    | oise                             | 1. Factory<br>2. All equidad.<br>3. Steel e<br>FERATION<br>7. Operati<br>must mo<br>2. Minor r<br>3. Only \$2<br>by unsk<br>4. Flood-t                                                                              | or distri<br>ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor syst<br>egular ser<br>00 worth of<br>illed labo<br>ype spray | butor instal<br>sck transport<br>ersonnel and<br><b>NANCE REO</b><br>matic. Oper<br>sem for volum<br>vice: oiling<br>of replaceabl       | ed to site 4<br>plumbing sk<br>UIREMENTS<br>ator (sewage<br>e, speed, ei<br>, checking n<br>e moving par | ills requir<br>e plant or<br>tc.<br>nozzles for<br>rts; can be                                             |
| SIZING 8<br>1. Modul<br>gat<br>add<br>COSTS<br>1. Cos<br>Mus<br>2. Opt<br>ext:<br>MODEL<br>NUMBER<br>(MAJOR)<br>All    | a GROW<br>ular sy<br>ion dem<br>ing tru<br>ts vary<br>t be fa<br>ional m<br>ra.<br>TECH | VTH PC<br>rstem c<br>rands<br>iss sec<br>r for i<br>rotory<br>botor d  | DTENTIA<br>an be ac<br>over a v<br>tions ar<br>installat<br>or distri<br>infven ur<br>ERFORMAJ | Liapted t<br>side rar<br>nd nozzi<br>tion sit<br>ributor<br>nit for                         | to differe<br>rige of cap<br>es.<br>te topogra<br>finstalled<br>low-press                 | operati<br>read                                          | and sizes<br>etion, sea<br>sed.<br>uent costs<br>MG N<br>MERI C | son. OP                          | <ol> <li>Factory</li> <li>Factory</li> <li>All equidadity</li> <li>Steel e</li> <li>FRATION</li> <li>Operatimust model</li> <li>Minor r</li> <li>Only \$2<br/>by unsk</li> <li>Flood-t</li> <li>STANDARD</li> </ol> | or distri<br>ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor syst<br>egular ser<br>00 worth of<br>illed labo<br>ype spray | butor instal<br>ack transport<br>ersonnel and<br><b>NANCE REQ</b><br>matic. Oper<br>em for volum<br>vvice: oiling<br>of replaceabl<br>r. | ed to site 4<br>plumbing sk<br>UIREMENTS<br>ator (sewage<br>e, speed, ei<br>, checking n<br>e moving par | ills requir<br>e plant or<br>tc.<br>nozzles for<br>rts; can be                                             |
| 20. Acre<br>SiZING 8<br>1. Mod<br>gat<br>add<br>COSTS<br>1. Cos<br>Mus<br>2. Opt<br>ext:<br>MODEL<br>NUMBER<br>(MAJOR) | ts vary<br>t be fa<br>ional m<br>ra.                                                    | vTH PC<br>rstem c<br>rands<br>iss sec<br>r for i<br>foctory<br>hotor d | DTENTIA<br>an be ac<br>over a v<br>tions ar<br>installat<br>or distri<br>infven ur<br>ERFORMAJ | Liapted t<br>side rar<br>nd nozzi<br>tion sit<br>ributor<br>nit for<br>NCE-OUTP<br>NCTUAL V | to differe<br>rige of cap<br>es.<br>te topogra<br>finstalled<br>low-press                 | ophy, loca<br>/supervis<br>ure efflu<br>OPERATI<br>RANGE | NG NG NG                                                        | son. OP                          | 1. Factory<br>2. All equidad.<br>3. Steel e<br>FERATION<br>7. Operati<br>must mo<br>2. Minor r<br>3. Only \$2<br>by unsk<br>4. Flood-t                                                                              | or distri<br>ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor syst<br>egular ser<br>00 worth of<br>illed labo<br>ype spray | butor instal<br>ack transport<br>ersonnel and<br><b>NANCE REQ</b><br>matic. Oper<br>em for volum<br>vvice: oiling<br>of replaceabl<br>r. | ed to site 4<br>plumbing sk<br>UIREMENTS<br>ator (sewage<br>e, speed, ei<br>, checking n<br>e moving par | ills requir<br>e plant or<br>tc.<br>nozzles for<br>rts; can be                                             |
| SIZING 8<br>1. Modul<br>gat<br>add<br>COSTS<br>1. Cos<br>Mus<br>2. Opt<br>ext:<br>MODEL<br>NUMBER<br>(MAJOR)<br>All    | ts vary<br>t be fa<br>ional m<br>ra.                                                    | vTH PC<br>rstem c<br>rands<br>iss sec<br>r for i<br>foctory<br>hotor d | DTENTIA<br>an be ac<br>over a v<br>tions ar<br>installat<br>or distri<br>infven ur<br>ERFORMAJ | Liapted t<br>side rar<br>nd nozzi<br>tion sit<br>ributor<br>nit for<br>NCE-OUTP<br>NCTUAL V | to differe<br>rige of cap<br>es.<br>te topogra<br>finstalled<br>low-press                 | operati<br>read                                          | NG NG NG                                                        | oisz<br>or<br>see.               | 1. Factory<br>2. All equidad.<br>3. Steel e<br>FERATION<br>7. Operati<br>must mo<br>2. Minor r<br>3. Only \$2<br>by unsk<br>4. Flood-t                                                                              | or distri<br>ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor syst<br>egular ser<br>00 worth of<br>illed labo<br>ype spray | butor instal<br>ack transport<br>ersonnel and<br><b>NANCE REQ</b><br>matic. Oper<br>em for volum<br>vvice: oiling<br>of replaceabl<br>r. | ed to site 4<br>plumbing sk<br>UIREMENTS<br>ator (sewage<br>e, speed, ei<br>, checking n<br>e moving par | ills requir<br>e plant or<br>tc.<br>nozzles for<br>rts; can be                                             |
| SIZING 8<br>1. Modul<br>gat<br>add<br>COSTS<br>1. Cos<br>Mus<br>2. Opt<br>ext:<br>MODEL<br>NUMBER<br>(MAJOR)<br>All    | ts vary<br>t be fa<br>ional m<br>ra.                                                    | vTH PC<br>rstem c<br>rands<br>iss sec<br>r for i<br>foctory<br>hotor d | DTENTIA<br>an be ac<br>over a v<br>tions ar<br>installat<br>or distri<br>infven ur<br>ERFORMAJ | Liapted t<br>side rar<br>nd nozzi<br>tion sit<br>ributor<br>nit for<br>NCE-OUTP<br>NCTUAL V | to differe<br>rige of cap<br>es.<br>te topogra<br>finstalled<br>low-press                 | operati<br>read                                          | NG NG NG                                                        | oisz<br>or<br>see.               | 1. Factory<br>2. All equidad.<br>3. Steel e<br>FERATION<br>7. Operati<br>must mo<br>2. Minor r<br>3. Only \$2<br>by unsk<br>4. Flood-t                                                                              | or distri<br>ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor syst<br>egular ser<br>00 worth of<br>illed labo<br>ype spray | butor instal<br>ack transport<br>ersonnel and<br><b>NANCE REQ</b><br>matic. Oper<br>em for volum<br>vvice: oiling<br>of replaceabl<br>r. | ed to site 4<br>plumbing sk<br>UIREMENTS<br>ator (sewage<br>e, speed, ei<br>, checking n<br>e moving par | ills requir<br>e plant or<br>tc.<br>nozzles for<br>rts; can be                                             |
| SIZING 8<br>1. Modul<br>gat<br>add<br>COSTS<br>1. Cos<br>Mus<br>2. Opt<br>ext:<br>MODEL<br>NUMBER<br>(MAJOR)<br>All    | ts vary<br>t be fa<br>ional m<br>ra.                                                    | vTH PC<br>rstem c<br>rands<br>iss sec<br>r for i<br>foctory<br>hotor d | DTENTIA<br>an be ac<br>over a v<br>tions ar<br>installat<br>or distri<br>infven ur<br>ERFORMAJ | Liapted t<br>side rar<br>nd nozzi<br>tion sit<br>ributor<br>nit for<br>NCE-OUTP<br>NCTUAL V | to differe<br>rige of cap<br>es.<br>te topogra<br>finstalled<br>low-press                 | operati<br>read                                          | NG NG NG                                                        | oisz<br>or<br>see.               | 1. Factory<br>2. All equidad.<br>3. Steel e<br>FERATION<br>7. Operati<br>must mo<br>2. Minor r<br>3. Only \$2<br>by unsk<br>4. Flood-t                                                                              | or distri<br>ipment tru<br>rection pe<br><b>&amp; MAINTE</b><br>on is auto<br>nitor syst<br>egular ser<br>00 worth of<br>illed labo<br>ype spray | butor instal<br>ack transport<br>ersonnel and<br><b>NANCE REQ</b><br>matic. Oper<br>em for volum<br>vvice: oiling<br>of replaceabl<br>r. | ed to site 4<br>plumbing sk<br>UIREMENTS<br>ator (sewage<br>e, speed, ei<br>, checking n<br>e moving par | ills requi<br>plant or<br>tc.<br>nozzles fo<br>rts; can b                                                  |

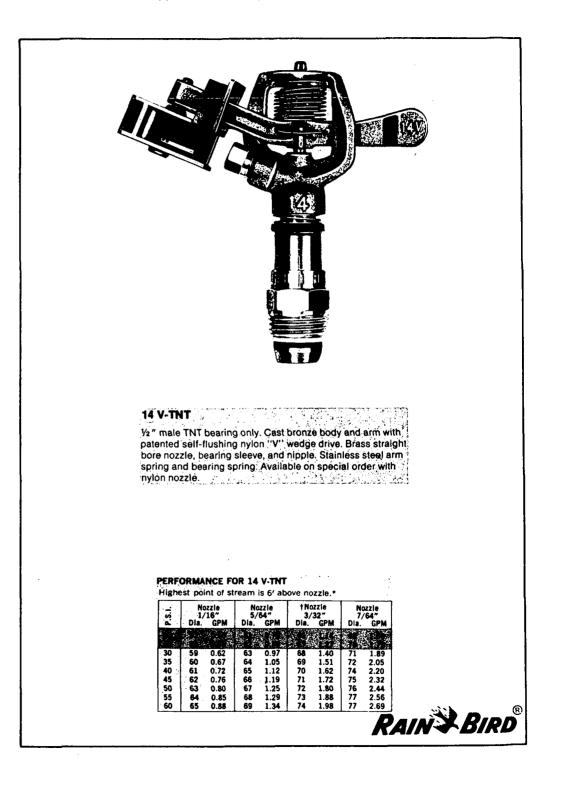


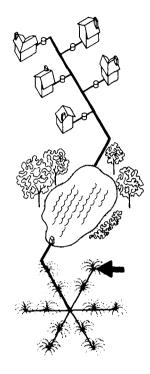


| FEATUR                                                                           |                                                                                                                  |                                                                                                   |                                                                                          |                                                                                                         | hief Engine                                                                    |                                                                                                   |                                                                          |                                                     | PERATION                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | (Pi                                                                                                             | ERFORAT                                                     | red)                                                         |
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| 2. Usi<br>se<br>se<br>3. Pe<br>sh<br>4. In<br>roi<br>5. Di<br>la<br>di:<br>6. Co | ed for<br>otic ta<br>vers, a<br>forate<br>eet).<br>ert mat<br>ot-resi<br>fferent<br>rger ha<br>stribut<br>upling | conveya<br>nk and<br>nd comt<br>d pipe<br>erials<br>stant.<br>sized<br>s four<br>ion of<br>sealed | ance of<br>leach:<br>binatic<br>used f<br>resist<br>diamen<br>rows c<br>efflue<br>by fri | f sewage<br>ing fiel<br>ons ther<br>for leac<br>tant to<br>ters; sm<br>of holes<br>ent to d<br>iction-h | hing field<br>chemicals<br>aller has<br>, all in b<br>isposal fi<br>eated coup | between J<br>septic s<br>s (discuss<br>and deter<br>two rows o<br>ottom hal<br>eld.<br>ling rings | ystems an<br>sed on th<br>ioration<br>of holes<br>f of pipe<br>s or othe | d<br>is<br>and<br>for                               | treatme<br>2. Treated<br>box or<br>3. Accordi<br>lines o                               | nt tank.<br>and settle<br>"tee" or<br>ng to area<br>f perforat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | carries infi<br>edeffluent la<br>"wye" spreade<br>required for<br>ed pipe carry<br>disposal fie                 | eaves tank<br>ers.<br>r disposal<br>y water or              | k in pipeto<br>1 of efflue<br>n slight sl                    |
|                                                                                  |                                                                                                                  | adapte<br>Dimensi                                                                                 |                                                                                          | r jofnin                                                                                                | g non-fore                                                                     | T                                                                                                 | 7                                                                        |                                                     | 1 485)                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                 |                                                             |                                                              |
| MODEL<br>NUMBER<br>(MAJOR)                                                       | LENGTH                                                                                                           | T                                                                                                 | HEIG                                                                                     | WEIGH                                                                                                   |                                                                                | CAPACITY<br>(GAL.)                                                                                | SUGG. LI                                                                 | T INSTAL                                            |                                                                                        | DESIGN<br>LIFETIME<br>(YRS.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ELECTRICITY<br>(RATING)                                                                                         |                                                             | - OPER<br>SUP                                                |
| UP31C_<br>to<br>UP37C                                                            | 5', 8<br>or 10                                                                                                   | 2" tr                                                                                             | 5 6"roi                                                                                  | 4" -<br>und 2.7<br>1b/f                                                                                 | AK.                                                                            | NA                                                                                                | FACTOR                                                                   | ,                                                   |                                                                                        | 40<br>(varies)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                 | <u> </u>                                                    | Influ<br>or<br>Efflu                                         |
| 0F370                                                                            |                                                                                                                  | 1                                                                                                 | +                                                                                        |                                                                                                         | ·                                                                              |                                                                                                   |                                                                          |                                                     |                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <u> </u>                                                                                                        | <u> </u>                                                    |                                                              |
|                                                                                  |                                                                                                                  | †                                                                                                 | 1                                                                                        | +                                                                                                       | 1                                                                              | <u> </u>                                                                                          |                                                                          |                                                     |                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <u>├</u> ──                                                                                                     |                                                             |                                                              |
| ,                                                                                |                                                                                                                  | †—                                                                                                | +                                                                                        |                                                                                                         | 1                                                                              | 1                                                                                                 | 1                                                                        |                                                     | -                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                 | 1                                                           | -+                                                           |
|                                                                                  |                                                                                                                  |                                                                                                   |                                                                                          |                                                                                                         |                                                                                | •                                                                                                 | •                                                                        |                                                     |                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                 |                                                             |                                                              |
| 1. Un<br>COSTS<br>1. Pi                                                          | imited                                                                                                           | Ompetft                                                                                           | tively                                                                                   | with c]                                                                                                 | ay and pla<br>or costs o                                                       | stic pipe<br>ver clay.                                                                            |                                                                          |                                                     |                                                                                        | and draina                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | REMENTS<br>ge bed system<br>NANCE REQI                                                                          |                                                             |                                                              |
| COSTS<br>1. Pi<br>2. In                                                          | imited<br>ficed c<br>tallat                                                                                      | ompetit<br>ion sav                                                                                | tivelv<br>ves 653<br>MERFORM                                                             | with cl<br>cn lab                                                                                       | or costs o                                                                     | stic pipe.<br>ver clay.<br>OPERATI                                                                |                                                                          |                                                     | 1. Trench                                                                              | & MAINTE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ye bed system                                                                                                   |                                                             | TS                                                           |
| 1. Un<br>COSTS<br>1. Pi<br>2. In:<br>NUMBER<br>(MAJOR)                           | imited<br>ficed c<br>tallat                                                                                      | ompetit<br>ion sav                                                                                | tivelv<br>ves 653<br>MERFORM                                                             | with cl<br>cn lab                                                                                       | or costs o                                                                     | ver clay.                                                                                         | NG<br>S<br>HER)                                                          | NOISE<br>8<br>0000RS                                | 1. Trench                                                                              | & MAINTE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | NANCE REQU                                                                                                      | UIREMEN'                                                    | CRUSHI<br>STRENG                                             |
| 1. Un<br>COSTS<br>1. Pi<br>2. In<br>MODEL<br>NUMBER                              | imited<br>ficed c<br>tallat<br>TECH<br>IR = 1                                                                    | ompetit<br>ion sav                                                                                | tively<br>ves 653<br>ERFORM<br>TION, A                                                   | with cl<br>con lab                                                                                      | or costs o                                                                     | OPERATI<br>RANGE                                                                                  | NG<br>S<br>HER)<br>ii                                                    |                                                     | 1. Trench                                                                              | And drafnar<br>A MAINTE<br>PERFOI<br>PERFOI<br>2"-4"<br>holes<br>5"-6"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NANCE REQU<br>NANCE REQU<br>RATIONS<br>: 2 rows of 1<br>at 3" spacin<br>: 2 or 4 rows                           | 5/16"<br>59 0 0                                             | CRUSHI<br>STRENG<br>Greate<br>than                           |
| 1. Un<br>COSTS<br>1. Pi<br>2. In:<br>MADGEL<br>MAJGRJ<br>UP31C<br>to             | imited<br>ficed c:<br>tallat<br>TECH<br>IR = 1<br>BOD <sub>B</sub>                                               | Ompetfi<br>ion sav                                                                                | tively<br>ves 653<br>ERFORM<br>TION, A<br>DO                                             | with cl<br>on lab                                                                                       | or costs o<br>דעד                                                              | OPERATI<br>RANGE                                                                                  | NG<br>S<br>HER)<br>ii                                                    | NOISE<br>8<br>0000RS<br>0dors, 1<br>propily         | 1. Trench<br>PERATION<br>STANDARD<br>CODES MET<br>See Tech.                            | And draina<br>A MAINTE<br>PERF0<br>2"-4"<br>boles<br>5/16"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NANCE REQU                                                                                                      | 5/16"<br>59 0 0                                             | TS<br>CRUSHI<br>STRENG<br>Greate                             |
| 1. Un<br>COSTS<br>1. Pi<br>2. In:<br>MADGEL<br>MAJGRJ<br>UP31C<br>to             | imited<br>ficed c:<br>tallat<br>TECH<br>IR = 1<br>BOD <sub>B</sub>                                               | Ompetfi<br>ion sav                                                                                | tively<br>ves 653<br>ERFORM<br>TION, A<br>DO                                             | with cl<br>on lab                                                                                       | or costs o<br>דעד                                                              | OPERATI<br>RANGE                                                                                  | NG<br>S<br>HER)<br>ii                                                    | NOISE<br>8<br>0000RS<br>0dors, 1<br>propily         | 1. Trench<br>PERATION<br>STANDARD<br>CODES MET<br>See Tech.                            | And draina<br>A MAINTE<br>PERF0<br>2"-4"<br>boles<br>5/16"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NANCE REQU<br>NANCE REQU<br>RATIONS<br>: 2 rows of 1<br>at 3" spacin<br>: 2 or 4 rows<br>holes at 3"            | 5/16"<br>59 0 0                                             | CRUSHI<br>STRENG<br>Greate<br>clay :<br>BP1                  |
| 1. Un<br>COSTS<br>1. Pi<br>2. In:<br>MADGEL<br>MAJGRJ<br>UP31C<br>to             | imited<br>ficed c:<br>tallat<br>TECH<br>IR = 1<br>BOD <sub>B</sub>                                               | Ompetfi<br>ion sav                                                                                | tively<br>ves 653<br>ERFORM<br>TION, A<br>DO                                             | with cl<br>on lab                                                                                       | or costs o<br>דעד                                                              | OPERATI<br>RANGE                                                                                  | NG<br>S<br>HER)<br>ii                                                    | NOISE<br>8<br>0000RS<br>0dors, 1<br>propily         | 1. Trench<br>PERATION<br>STANDARD<br>CODES MET<br>See Tech.                            | And draina<br>A MAINTE<br>PERF0<br>2"-4"<br>boles<br>5/16"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NANCE REQU<br>NANCE REQU<br>RATIONS<br>: 2 rows of 1<br>at 3" spacin<br>: 2 or 4 rows<br>holes at 3"            | 5/16"<br>59 0 0                                             | CRUSHI<br>STRENG<br>Greate<br>clay :<br>BP1                  |
| 1. Un<br>COSTS<br>1. Pi<br>2. In:<br>MODEL<br>MAJGEL<br>UP31C_<br>to             | finited<br>ficed c<br>tallat<br>TECC<br>R=<br>BOOg<br>NA                                                         | onpetition sav                                                                                    | tively<br>ves 653<br>Tion, A<br>DO<br>NA                                                 | with cl<br>on lab                                                                                       |                                                                                | OPERATI<br>RANGE                                                                                  | NG<br>S<br>HER)<br>ii                                                    | NOISE<br>B<br>OGORS<br>Odors,<br>prop'ly<br>stalled | 1. Trench<br>SPERATION<br>STANDARD<br>CODES MET<br>See Tech.<br>Perf. Belo             | And drafnar<br>Amage MAINTE<br>Amage MAINTE<br>Ama | NANCE REQU<br>NANCE REQU<br>RATIONS<br>: 2 rows of 1<br>at 3" spacin<br>boles at 3"<br>and 200°                 | JIREMEN<br>5/16"<br>90°<br>sof<br>spacing                   | CRUSHI<br>STREMC<br>Greate<br>thar<br>clay;<br>BPI<br>standi |
| 1. Un<br>COSTS<br>1. Pi<br>2. In:<br>NUMBER<br>IMAJORI<br>UP31C<br>UP37C         | finited<br>ficed c<br>tallat<br>TECC<br>R=<br>BOOg<br>NA                                                         | onpetition sav                                                                                    | tively<br>ves 653<br>Tion, A<br>DO<br>NA                                                 | with cl<br>on lab                                                                                       |                                                                                | OPERATI<br>RANGE                                                                                  | NG<br>S<br>HER)<br>ii                                                    | NOISE<br>B<br>OGORS<br>Odors,<br>prop'ly<br>stalled | 1. Trench<br>SPERATION<br>See Tech.<br>Perf. Belo<br>FECHNICAL<br>1. Bureau<br>Spec. S | And drainar<br>Amain Amain Ama<br>Amain Amain br>Amain Amain br>Amain Amain Amain Amain Amain Amain Amain Amain Amai                                                                                                                                                                                                                                                                                             | NANCE REON<br>NANCE REON<br>RATIONS<br>: 2 rows of 1<br>at 3" spaci<br>: 2 or 4 rows<br>holes at 3"<br>and 200° | JIREMEN<br>5/16"<br>9 g g 99°<br>5 of<br>spacing<br>spacing | CRUSHI<br>STREMO<br>Greate<br>thar<br>clay p<br>standa       |









| 70<br>Gl                   | 45 NOR<br>ENDOI<br>13) 335-   | TH GF<br>RA, CA | LIFO           | AVE.<br>RNIA 91    | IFACTURI<br>740                                     | NG CO.                   |                          |                   |                        |                         | SPRINKI                        |                                               | BIRD <sup>®</sup>    | TION  |
|----------------------------|-------------------------------|-----------------|----------------|--------------------|-----------------------------------------------------|--------------------------|--------------------------|-------------------|------------------------|-------------------------|--------------------------------|-----------------------------------------------|----------------------|-------|
| ler                        | ull lin<br>s and r            | elated          | acce           | ssories            | ntrol valv<br>for agricu<br>e effluent<br>ate range | ltural, go               | olf course               | 01-               | mended 1<br>2. 70E-TNT | for low ap<br>full circ | cle impact sp<br>plication rai | orinkler (il<br>tes (as on s<br>rinkler gives | ustrated) re         | -c om |
| _                          |                               | MAENSIC         |                | T                  |                                                     | r                        | <u> </u>                 | TTE (00)          |                        | -                       | T                              | OUIREMENTS                                    | <u> </u>             |       |
| MODEL<br>NUMBER            |                               |                 | 1              | WEIGH              | T RATED                                             | CAPACITY                 | SUGG. LIST               | INSTAL            |                        | DESIGN<br>LIFETIME      | ELECTRICITY                    | WATER ,                                       |                      | ĺ     |
| (MAJOR)                    | LENGTH                        | WIDTH           | HEK            |                    | (GPM)                                               | HOAL.)                   | (FOB<br>FACTORY)         | COST              |                        | (VRL)                   | (RATING)                       | PRESSURE                                      |                      |       |
| 14V-TNT                    |                               |                 |                | 0.4<br>ship        | g                                                   |                          | \$5.70<br>each           |                   |                        |                         | NA                             | 30-60 PSI                                     | Water or<br>Effluent | L     |
| 70E-TNT                    |                               |                 |                | 2.6<br>ship        | 9                                                   | L                        | \$17.50<br>each          |                   |                        |                         | "                              | 50-80 PSI                                     | n                    |       |
|                            |                               |                 |                |                    |                                                     |                          |                          |                   |                        |                         |                                | _                                             |                      |       |
|                            |                               |                 |                |                    |                                                     |                          |                          |                   |                        |                         | L                              |                                               |                      |       |
|                            | _                             |                 |                |                    |                                                     |                          |                          |                   |                        |                         | <sup>1</sup> At spray          | nozzle.                                       |                      |       |
| in                         | ay syst<br>additio<br>istance | n to s          | ludes<br>prink | pumps,<br>lers. Co | piping, va<br>ontact sali                           | lves, cont<br>es enginee | crols, etc<br>er for des | .                 | PERATION               | & MAINTE                | NANCE REQU                     | JIREMENTS                                     |                      |       |
| MODEL<br>NUMBER<br>(MAJOR) |                               |                 |                | ANCE-OUT           |                                                     | OPERATI<br>RANGE         | •                        | Dise<br>B<br>DORS | STANDARDS<br>CODES MET |                         | COVERED                        |                                               |                      |       |
| ]4V-TNT                    |                               |                 |                |                    |                                                     |                          |                          |                   |                        | 60 t                    | o 70 foot dia                  | ameter circu                                  | ar pattern.          |       |
| 70E-TNT                    |                               |                 |                |                    |                                                     |                          |                          |                   |                        | 125                     | to 181 foot o                  | diameter circ                                 | ular pattern         | ·     |
|                            |                               |                 |                |                    |                                                     |                          | $\square$                |                   |                        |                         |                                |                                               |                      |       |
|                            |                               |                 |                |                    |                                                     |                          |                          |                   |                        |                         |                                |                                               |                      |       |
| 1.1 y                      | ear gua                       | rantee          | on pa          |                    | VICE<br>wrned to mu<br>phout U.S.                   | anufacture               |                          |                   | COMMENTS               | PERFORM                 |                                | ATE AS OF _                                   | July 31, 197         | 2     |

## Water Consumption Reduction Techniques

Sewerless Toilet---Recycling Diffused Air Extended Aeration, 296 Aera-Filt Systems, Inc. Dole Flow Controls-Flow Reducing Valves, 298 Eaton Corporation Low Flush Toilet-Water-Saving Toilet System, 300 Microphor, Inc. Multi-Flo RS-1-Recycling Extended Aeration Filtration, 302 Multi-Flo. Inc. Multi-Flo RS-2-Recycling Extended Aeration Filtration, 304 Multi-Flo, Inc. Watts Pressure Valve-Water Pressure Reducing Valve, 306 Watts Regulator Co.

## Introduction

Reducing the amount of water consumed by a household will generally reduce the amount of wastewater generated. Less wastewater volume can be translated, within reasonable limits, into smaller treatment facilities. This can be especially important when the soil has to be used to absorb wastewater. Reduced per capita water demands can also mean that more people can be served by a well of fixed capacity or that the same population can be served by water systems of lesser capacities. Water consumption can be reduced by careful use by individuals, by reducing the amount of water that flows through plumbing fixtures, and by recycling water used for certain functions.

Water conservation on an individual level is an important aspect of water consumption reduction, but this book is concerned with items which can be designed into a household water system to reduce consumption even without the active cooperation of the homeowner. Such opportunities are presented by toilets which use less water per flush, by in-line fittings which limit the flow through a fixture such as a showerhead, by pressure reducing valves when the water supply pressure exceeds 50 pounds per square inch (psi), and by reuse of washwater and even treated water from toilets for flushing toilets.

A 1969 study by General Dynamics estimated net annual savings from various flow reduction devices as follows: [39]

| Two faucet aerators                                        | \$ 0.67            |
|------------------------------------------------------------|--------------------|
| Flow control showers                                       | 10.00              |
| Shallow trap water closets (toilets which use less water)  | 4.39               |
| Automatic flush valves                                     | 2.15-3.30          |
| Reuse of washwater (not the systems shown in this section) | -4.75 (a net loss) |

The net savings were estimated on the basis of average water and sewer charges saved, savings in fuel for heating of water, straight proration (no amortization) of capital costs over equipment lifetime, and installation costs. The estimates would vary considerably as water and wastewater treatment rates change according to local conditions.

The \$10 net annual savings estimated for flow control showers was based on a \$30 installed price prorated over fifteen years to yield \$2 per year in costs against a \$12 gross annual savings in water and sewer costs and water heating bills. If the \$12 gross saving is compared with the list price of about \$3 for shower flow control devices (which can be screwed in-line between showerhead and water pipe in a few minutes time), it is clear that capital can be recovered in less than a year. Similarly, if one estimates that water consumption can be reduced by about 15 per cent overall by installing a pressure reducing valve in a house supplied with 80 psi pressure, the savings would amount to \$10.80 annually based on a straight percentage of a \$6 monthly water bill. Since the valves cost less than \$20 to purchase, capital can be recovered in about two years for new installations and three or four years for retrofits in existing plumbing (where installation costs would be significant).

Table 23 shows two estimates of water flow reduction prospects that were made for the various household consumption profiles shown in Table 4.

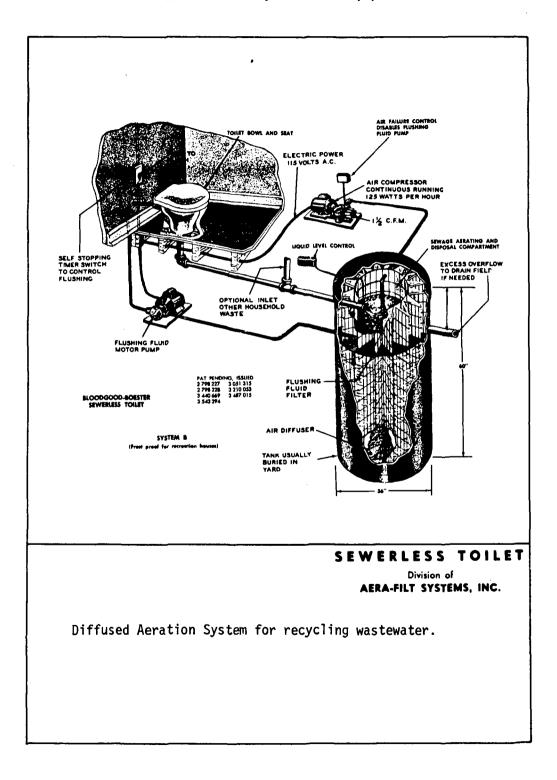
| Total Water Consumption<br>Without Flow Reduction<br>(GPCD) | Savings, with<br>Flow Control and<br>Low-Flush Toilets<br>(GPCD) | Savings, with<br>Flow Control and<br>Recycled Washwater<br>for Flushing<br>(GPCD) |
|-------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 30                                                          | 11                                                               | 20                                                                                |
| 40                                                          | 13                                                               | 22                                                                                |
| 50                                                          | 17                                                               | 29                                                                                |
| 75                                                          | 20                                                               | 35                                                                                |
| 100                                                         | 26                                                               | 44                                                                                |

| Table 23. Water Flow Reduction Estimates. | Та | ble | 23. | Water | Flow | Reduction | Estimates. |
|-------------------------------------------|----|-----|-----|-------|------|-----------|------------|
|-------------------------------------------|----|-----|-----|-------|------|-----------|------------|

Both estimates assumed that pressure reducing valves and/or flow control fittings reduced flow through shower, lavatory and sink fixtures by 33 percent. This reduction was assumed to be half-effective in kitchens, yielding about a 15 per cent reduction because about half of the water demand in a kitchen is for filling fixed-volume containers, such as sinks, pots, and kettles, and is therefore independent of flow rate. The other half is used for washing hands, rinsing dishes, and so forth, and would depend on the flow rate. No reduction was postulated for laundry use, which was assumed to be a fixed-volume demand. The two estimates differed only for toilet-flushing. The first estimate assumed a 40 per cent reduction based on using a low-flush toilet requiring three gallons per flush instead of the usual five.\* The second estimate assumed that toilets were supplied with recycled washwater and therefore that a 100 per cent saving of flush water was effected.

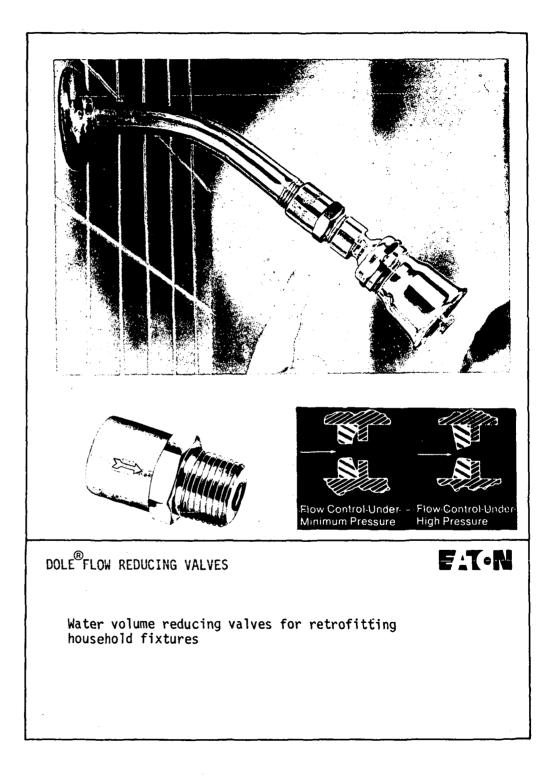
The numbers indicate that water consumption can be reduced by as much as 30 to 50 per cent (from normal consumption rates of 50 to 75 GPCD) with the use of flow reduction techniques presented in this section.

<sup>\*</sup>The low-flush toilet is offered by at least one U.S. manufacturer of plumbing equipment. It is not illustrated in this section, but is generally available through plumbing supply houses.

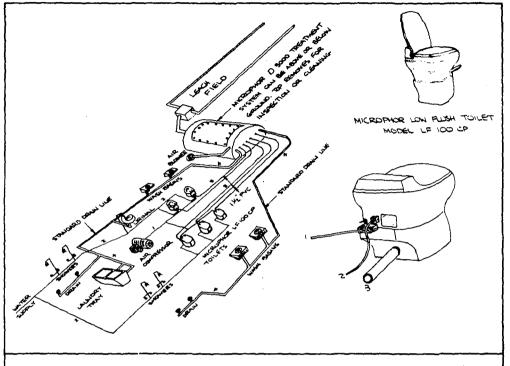


2 A

| I U                                 | 0. 80)<br>AFAYE<br>17) 742                                     | ( 567<br>TTE, il<br>:4205                         | STEMS, I<br>NDIANA<br>Carl Boast                | 47901                                        | dent                                          |                                                           |                       |         |                                                            | :                                    |                             | NG DIFFUSI                                   | S TOILE                                        |                         |
|-------------------------------------|----------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------|----------------------------------------------|-----------------------------------------------|-----------------------------------------------------------|-----------------------|---------|------------------------------------------------------------|--------------------------------------|-----------------------------|----------------------------------------------|------------------------------------------------|-------------------------|
| fo<br>2. Fo<br>3. Fo<br>4. Ef<br>fl | es syst<br>r toile<br>r use wi<br>r use wi<br>fluent<br>ushing | t use)<br>here wa<br>here so<br>is tako<br>re-use | to dispo<br>ater is i<br>ewage lic<br>en from s | ose of h<br>in short<br>juid dis<br>iewage t | uman was<br>supply.<br>charge is<br>ank and p | dor-free,<br>te.<br>s difficul<br>sumped for<br>tank wate | t.<br>toilet          | ed      | <ol> <li>Water fi<br/>and is a</li> <li>Control</li> </ol> | rom toilet<br>serated an             | (other water<br>d filtered. | optional)                                    | SI) from tank<br>goes to tank<br>or or overflo | (gravity                |
|                                     |                                                                | DIMENSI                                           | ONS 1                                           | 1                                            |                                               | т.—                                                       |                       |         |                                                            |                                      |                             | JUIREMENTS                                   | r                                              |                         |
| MODEL<br>NUMBER<br>(MAJOR)          | LENGTH                                                         | T -                                               | <b>_</b>                                        | WEIGHT                                       | RATED<br>CAPACITY<br>(GPD)                    | TANK<br>CAPACITY<br>(GAL.)                                | SUGG, LIST<br>(FOB    | INSTALL |                                                            | DESIGN<br>LIFETIME<br>(YRL)          | ELECTRICITY<br>(RATING)     |                                              | OPERATING<br>SUPPLIES                          |                         |
| A-3                                 | 36"                                                            | 36"                                               | 60"                                             |                                              | One<br>family                                 | 150-200                                                   | See<br>Costs<br>Below |         | 20/year                                                    |                                      | 115-120 V<br>AC; 60 Hz      |                                              | None                                           |                         |
|                                     | <b> </b>                                                       | <u> </u>                                          |                                                 |                                              |                                               |                                                           |                       |         |                                                            | ·                                    |                             |                                              | <br>                                           |                         |
|                                     | <b> </b>                                                       |                                                   |                                                 |                                              |                                               |                                                           |                       |         |                                                            |                                      |                             |                                              |                                                |                         |
|                                     | L.                                                             | 1 <sub>Also</sub>                                 | space fo                                        | r air c                                      | ompresso:                                     | <br>• and                                                 |                       |         | <sup>2</sup> Elect                                         | ricity only                          | y; service co               | sts addition                                 |                                                | L                       |
| ça                                  | ntrols, p                                                      | piping                                            | and tank                                        | s.                                           |                                               | e pump, co<br>on (see Re                                  | -                     | s}.     | <ol> <li>Control:<br/>or over</li> <li>Pumping</li> </ol>  | s disable<br>flow of sy<br>of sewage | stem.<br>required, po       | o, notifying<br>ossible cleau                | owner of bre<br>ning of filte<br>d colored toi | rs.                     |
| MODEL<br>NUMBER<br>(MAJOR)          | TECH<br>(R - 1                                                 | K REDUC                                           | ERFORMAN<br>TION, A - A                         | NAT                                          | ALUE)<br>ER                                   | OPERATI<br>RANGE                                          |                       |         | ETANDARDI<br>&<br>CODES MET                                |                                      |                             |                                              |                                                |                         |
| A-3                                 | (m)<br>98                                                      | (A)<br>96                                         | бррт                                            | Up<br>50                                     | to                                            | Indoor fa<br>ties: tan<br>undergrou                       | k i                   |         | Patents<br>pending;<br>issued                              | +                                    |                             |                                              |                                                |                         |
|                                     |                                                                |                                                   |                                                 |                                              |                                               |                                                           |                       |         |                                                            |                                      |                             |                                              |                                                |                         |
|                                     |                                                                |                                                   |                                                 | _                                            |                                               |                                                           |                       |         |                                                            |                                      |                             |                                              |                                                |                         |
|                                     |                                                                |                                                   |                                                 |                                              |                                               |                                                           |                       |         |                                                            |                                      |                             |                                              |                                                |                         |
|                                     |                                                                |                                                   |                                                 |                                              |                                               |                                                           |                       |         |                                                            |                                      |                             |                                              |                                                |                         |
| 1. Wai<br>2. So                     | ranty o                                                        | on part<br>out of                                 | 'main pl                                        | & SERV<br>ebility                            | ICE<br>for peri                               |                                                           |                       | T       | ECHNICAL<br>1. U. S. P.                                    | PERFORM                              | ANCE<br>ding, issued:       | 2,798,22<br>2,798,22<br>3,440,66<br>3,543,29 | B 3,21<br>9 3,48                               | 1,315<br>0,053<br>7,015 |



| CA                                        | NTRO<br>1 EAST<br>(ROL S<br>12) 682- | 8025                             | SION                            |                                            | 87                                                          |                                  |                                         |                        |                      |                                  |                                                                                                     |                                                                       |                       |         |
|-------------------------------------------|--------------------------------------|----------------------------------|---------------------------------|--------------------------------------------|-------------------------------------------------------------|----------------------------------|-----------------------------------------|------------------------|----------------------|----------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------|---------|
| 2. All<br>3. Mai<br>125                   | ves fi<br>chroma<br>ntain o<br>PSI w | e-plated<br>Constant<br>ith only | : flow (<br>/ 5-8% v            | FMC Se<br>volume)<br>ariatio               | ries, whi<br>at press<br>n over th                          | ures from<br>is range.           | kel plate<br>15 PSI ti<br>ated) flor    | 1.<br>5 2              | to main<br>. Orifice | t <i>ain const</i><br>s are wide | ant flow rate                                                                                       |                                                                       | y with the pr         |         |
|                                           |                                      | MENSIO                           | MB                              |                                            |                                                             |                                  | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ |                        |                      |                                  | UTILITY RE                                                                                          | OUREMENTS                                                             | Г                     |         |
| MODEL<br>NUMBER<br>(MAJOR)                | LENGTH                               | MOTH                             | HEIGHT                          | WEIGHT                                     | RATED<br>CAPACITY<br>(GPD)                                  | TANK<br>CAPACITY<br>(GAL.)       |                                         | INSTALL<br>COST        |                      | DESIGN<br>LIFETIME<br>(YRS.)     | ELECTRICITY<br>(RATING)                                                                             | WATER<br>PRESSURE                                                     | OPERATING<br>SUPPLIES |         |
| G Series                                  |                                      | lines,                           |                                 | 0.2                                        | NA                                                          | NA                               | \$3.52                                  |                        |                      |                                  | NA                                                                                                  | Up to<br>125 PSI                                                      |                       |         |
| FMB                                       | 378"<br>compr<br>NPT 1               | lines,<br>ession<br>inlet        | copper<br>putlet,               | "                                          |                                                             | "                                | \$3.05                                  |                        |                      |                                  | "                                                                                                   |                                                                       |                       |         |
| FMC<br>Series                             |                                      | lines,                           |                                 |                                            |                                                             | n                                | \$2.80                                  |                        |                      |                                  | "                                                                                                   | _                                                                     |                       |         |
| FMA                                       | 3/8"                                 | lines,                           | KPT                             | E                                          | "                                                           |                                  | \$2.80                                  |                        |                      |                                  | -                                                                                                   |                                                                       |                       |         |
|                                           |                                      |                                  |                                 |                                            |                                                             |                                  |                                         | I OP                   | ERATION              | & MAINTE                         | NANCE REQU                                                                                          | JIREMENTS                                                             |                       |         |
|                                           |                                      |                                  |                                 |                                            |                                                             |                                  |                                         |                        |                      |                                  | NANCE REQU<br>self-cleanir                                                                          |                                                                       |                       |         |
| MODEL<br>NUMBER<br>(MAJOR)                |                                      | REDUCT                           | RFORMAN<br>ION, A - AI<br>DO CO | CTUAL V                                    | ALUE)<br>TER FLOW                                           | OPERATIO<br>RANGES<br>(TEMP, OTH |                                         |                        |                      | evices are                       |                                                                                                     |                                                                       |                       |         |
| NUMBER                                    | (R-9                                 | REDUCT                           | ION, A - A                      | D WA                                       | ALUE)                                                       | RANGES                           | ier) O                                  | )                      | . None; de           | DESI                             | self-cleanir                                                                                        | ng.                                                                   | ndard shower 1        | heads : |
| NUMBER<br>(MAJOR)                         | (R-9                                 | REDUCT                           | ION, A - A                      | CTUAL V/                                   | ALUE)<br>TER FLOW<br>(A)<br>2.5, 3,                         | RANGES<br>(TEMP, OTH             | ier) O                                  | Dise<br>Dorse          | . None; de           | DESI                             | self-cleanir<br>GN FIXTURE <sup>1</sup><br>shower contro<br>2; GO=2.5; GH<br>lavatories wi          | ng.<br>D]; fits star<br>4=3; GL=4 GPM                                 |                       |         |
| NUMBER<br>(MAJOR)<br>G Series             | (R-9                                 | REDUCT                           | ION, A - A                      | CTUAL V.<br>D WA<br>2,<br>4<br>1.<br>2     | ALUE)<br>TER FLOW<br>(A)<br>2.5, 3,<br>GPM                  | RANGES<br>(TEMP, OTH             | i <mark>lere) o</mark> l                | alise<br>Books<br>Dine | . None; de           | DESIG                            | self-cleanir<br>GN FIXTURE <sup>1</sup><br>shower contro<br>2; GO=2.5; GH<br>lavatories wi          | ng.<br>51; fits star<br>4-3; GL=4 GPM<br>th 3/8" copp                 | 1.<br>per compressio  |         |
| NUMBER<br>MAJOR<br>G Series<br>FMB<br>FMC | (R-9                                 | REDUCT                           | ION, A - A                      | CTUAL V<br>D WA<br>2,<br>4<br>1.<br>2<br>4 | ALUE)<br>TER FLOW<br>IAI<br>2.5, 3,<br>GPM<br>5 GPM<br>, 3, | RANGES<br>(TEMP, OTH<br>Up to 16 | ieri oi                                 | DISE<br>DORS           | . None; de           | DESIG                            | self-cleanir<br>SN FIXTURE <sup>1</sup><br>shower contro<br>2; GO=2.5; GP<br>lavatories wi<br>ings. | ng.<br>); fits star<br>4-3; GL=4 GPH<br>ith 3/8" copp<br>i commercial | 1.<br>per compressio  | on      |



# Microphor

### Low Flush Toilet Treatment System Combination

This shotch poetrays the rest room facility at Rassian Galch State Park which has operated successfully. It is a new concept in providing sanitary thash toikets, a well treated efflexent and a minimum of water use. This facility restored a plugged back field and reduced the toilet restored a plugged back field and reduced the toilet stater use from 3000 to 150 gallows per day.

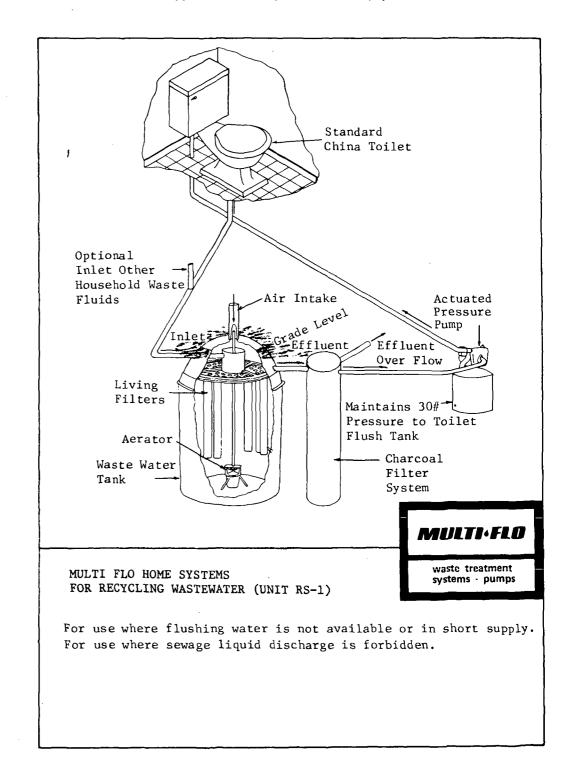
Fine Microphor Low Flush toilets were installed in place of the existing toilets. A Microphor Treatment System was buried out of sight near the building. The offlownt was conducted to an existing leach field.

There are extreme cases where the officent must be pumped from the area. In that case, Micropher efficient can be pumped economically at high presence through small pipes using open impeller pump since there are virtually no solids.

Operation: The shotch shows our Michopher Low Flush Toilet Model LF 100 CP which flushes on only 1½ quarts of water. After use, the user simply stope on the podal, which drops the waste into a hopper while clean (from water line marked 2) water cleans the bowl. Releasing the podal cleans the hopper and introduces a five second charge of compressed air (from air supply line 1). This ejects the waste through pipe 3 to the Microphor Treatment System Model O 3000. In the D.3000 the solids and dissolved organics are filtered out and a well treated effluent is discharged. At Russian Gulch this effluent was readily absorbed in a leach area that had perviously failed.

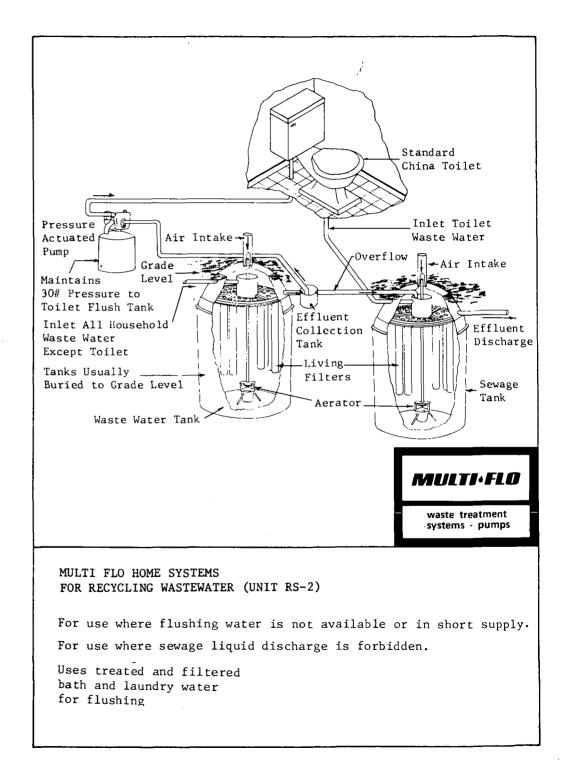
absorbed in a teach area that had perviously fuiled. Installation: In existing facilities the standard toilets are removed and the Microphor Model LF 100 CF is bolted in place. The air compressor and air lines (marked 1) are installed. Water at city pressure is connected to hose (marked 2). Waste discharge pipe (marked 3) is usually 1½? PVC schedule 40. The treatment system can be up to fifteen fort away and up to twenty-four inches higher than the toilets.

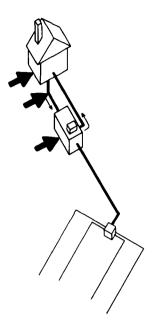
|                                                | ICROPH<br>15 EAST<br>ILLITS,<br>07) 469-<br>Attn: | SAN FI<br>CALIFO<br>5563                                    | RANCIS<br>DRNIA 9                                         | 95490                                                                           | E.<br>ec. Vice-Pi                                                                                   | resident                                                           |                                  |                                                      |                                                                                                                                                 |                                                                                                |                                                                                           |                                                                             | H TOILE                        |           |
|------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------|-----------|
| tre                                            | # flush                                           | units (                                                     | Annelge                                                   | ster);                                                                          | em LF-100<br>System TA                                                                              | ) goes wit<br>A-200 is s                                           | h additi<br>elf-cont             | iona 1<br>:a i ned                                   | OPERATION<br>1. Process                                                                                                                         |                                                                                                | on is found o                                                                             | on facing pag                                                               | ge.                            |           |
|                                                |                                                   |                                                             |                                                           | <b></b>                                                                         |                                                                                                     | 1                                                                  | r ,                              |                                                      |                                                                                                                                                 | <del></del>                                                                                    | T                                                                                         |                                                                             |                                | ·         |
| MODEL<br>NUMBER<br>(MAJOR)                     | LENGTH                                            | WIDTH                                                       | HEIGHT                                                    | WEIGHT<br>(LR.)                                                                 | RATED<br>CAPACITY<br>HOPDI                                                                          | TANK<br>CAPACITY<br>(GAL.)                                         | SUGO, LIS<br>(FOB                | 19617                                                | LL OPERATE                                                                                                                                      | DESIGN<br>LIFETIME<br>(YRL)                                                                    | ELECTRICITY<br>(RATING)                                                                   | WATER<br>PRESSURE                                                           |                                |           |
| LF-100                                         | 14"                                               | 16"                                                         | 18"                                                       |                                                                                 | Depends<br>on<br>System                                                                             |                                                                    | \$256.                           | 1                                                    |                                                                                                                                                 |                                                                                                | None                                                                                      | 1-1/2 qt./<br>flush                                                         | 1 oz. oil/1<br>month           |           |
| TA-200-                                        | 26"                                               | 26"                                                         | 30"                                                       |                                                                                 | 3 person<br>capacity                                                                                |                                                                    | <b>\$4</b> 75.                   |                                                      |                                                                                                                                                 |                                                                                                | 200 W<br>Intermit.                                                                        |                                                                             |                                |           |
|                                                | <b> </b>                                          | <b> </b>                                                    |                                                           |                                                                                 |                                                                                                     |                                                                    |                                  |                                                      |                                                                                                                                                 |                                                                                                | <b> </b>                                                                                  |                                                                             |                                |           |
|                                                |                                                   |                                                             |                                                           |                                                                                 |                                                                                                     |                                                                    |                                  |                                                      |                                                                                                                                                 |                                                                                                |                                                                                           | 1 <sub>0</sub> ,                                                            | lus chlorine,                  | 46        |
| 1. Pri<br>2 Pri                                |                                                   | - 100                                                       | · •••1                                                    | <b>t</b> u                                                                      |                                                                                                     |                                                                    |                                  |                                                      |                                                                                                                                                 |                                                                                                |                                                                                           | JIREMENTS                                                                   |                                |           |
|                                                | ice for                                           | TA-200                                                      |                                                           | lete un                                                                         | ft.                                                                                                 |                                                                    |                                  |                                                      |                                                                                                                                                 |                                                                                                | NANCE REOL<br>ply needed.                                                                 | JIREMENTS                                                                   |                                |           |
| MODEL                                          | TECH                                              | TA-200                                                      | 1s compi<br>RFORMAN                                       | Lete un                                                                         | ft.<br>UT<br>ALUE)                                                                                  | OPERATI<br>RANGEI                                                  |                                  | NOISE                                                | 1. Minimal                                                                                                                                      | water sup                                                                                      |                                                                                           | JIREMENTS                                                                   |                                |           |
| MODEL                                          | TECH                                              | TA-200<br>NICAL PEI<br>SREDUCTI                             | 1s compi                                                  | Iete un<br>CE-OUTPL<br>CTUAL VA<br>O OTHI                                       | ft.<br>UT<br>ALUE)<br>ER                                                                            |                                                                    | 1EM)                             |                                                      | 1. Minimal                                                                                                                                      | water sup                                                                                      |                                                                                           | JIREMENTS                                                                   |                                |           |
| MODEL<br>AUMBER<br>(MAJOR)<br>LF-100           | тесн<br>(R = %<br>ВОО <sub>В</sub>                | TA-200                                                      | 15 Comp1<br>RFORMAN<br>ION, A - A<br>DO CO                | CE-OUTPL<br>CTUAL VA<br>IO OTHI<br>A NA                                         | 1t.<br>ALUEF<br>ER<br>2                                                                             | RANGEI<br>(TEMP, OTH                                               | PF<br>ST<br>reeze nd             | Norse<br>Doors<br>None<br>1ght<br>ise ang            | 1. Minimal<br>STANDARD<br>CODES MET<br>FHA and V                                                                                                | water sup                                                                                      |                                                                                           | JIREMENTS                                                                   |                                |           |
| MODEL<br>NUMBER<br>(MAJOR)                     | TECH<br>(R = %<br>8005<br>NA<br>95                | TA-200                                                      | 1s comp1<br>RFORMAN<br>ION, A - A<br>DO CO<br>NA N/       | Iete un<br>CEOUTPL<br>CTUAL VI<br>NO OTHI<br>A NA<br>98                         | 1t.<br>ALUEF<br>ER<br>2                                                                             | 25-160<br>without f                                                | PF<br>ST<br>reeze nd             | Norse<br>Doors<br>None<br>1ght<br>ise ang            | 1. Minimal<br>STANDARD<br>CODES MET<br>FHA and V                                                                                                | water sup                                                                                      |                                                                                           | JIREMENTS                                                                   |                                |           |
| MODEL<br>AUMBER<br>(MAJOR)<br>LF-100           | TECH<br>(R = %<br>8005<br>NA<br>95                | TA-200                                                      | Is compl<br>RFORMAN<br>ION, A - A<br>ION CON<br>NA NU     | Iete un<br>CEOUTRI<br>CTUAL VI<br>IO OTHI<br>A NA<br>198<br>(R)                 | 1t.<br>ALUEF<br>ER<br>2                                                                             | RANGES<br>(TENP, OTH<br>25-160<br>25-160<br>without f<br>protectio | °F<br>ST<br>reeze no<br>n k1t od | Norse<br>Oppors<br>None<br>1ght<br>tise ang<br>ors,  | 1. Minimal<br>STANDARD<br>CODES MET<br>FHA and V                                                                                                | A ceal                                                                                         |                                                                                           |                                                                             |                                |           |
| MODEL<br>ALMRER<br>(MAJOR)<br>LF-100<br>TA-200 | TECH<br>(R = %<br>NA<br>95<br>(R)                 | NICAL PEI<br>REQUENT<br>ST I<br>NA I<br>97<br>(R)<br>SUARAN | 15 COMP1<br>RFORMANN<br>ION, A = AA<br>DO CO<br>NA NU<br> | CEOUTPL<br>CTUAL VJ<br>NO OTHI<br>A NA<br>" 98"<br>(N)<br>2<br>Settli<br>& SERV | ft.<br>UT<br>ALUE)<br>ER<br>2<br>2<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4<br>4 | RANGES<br>(TENP, OTH<br>25-160<br>25-160<br>without f<br>protectio | °F<br>ST<br>reeze no<br>n k1t od | Norse<br>Goors<br>None<br>tight<br>tise and<br>Dors, | 1. Minimal<br>STANDARD<br>CODES MET<br>FHA and V<br>NSF #23 S<br>odor at vent<br>TECHNICAL<br>1. Califor<br>2. The D-3<br>92% BOD<br>3. NSF has | A<br>eal<br>eal<br>PERFORM<br>nía Dept.<br>000 total<br>, 88% COD<br>, tested th<br>Disposal D | ANCE<br>of Parks back<br>of yatem ( low-f<br>and 9% SS r<br>ewl-90% SS r<br>evices (NSF S | s the low-fl<br>lush and tre<br>eduction.<br>et TA-200 und<br>itandard #23) | eatment) clai<br>ler Watercraf | t<br>them |



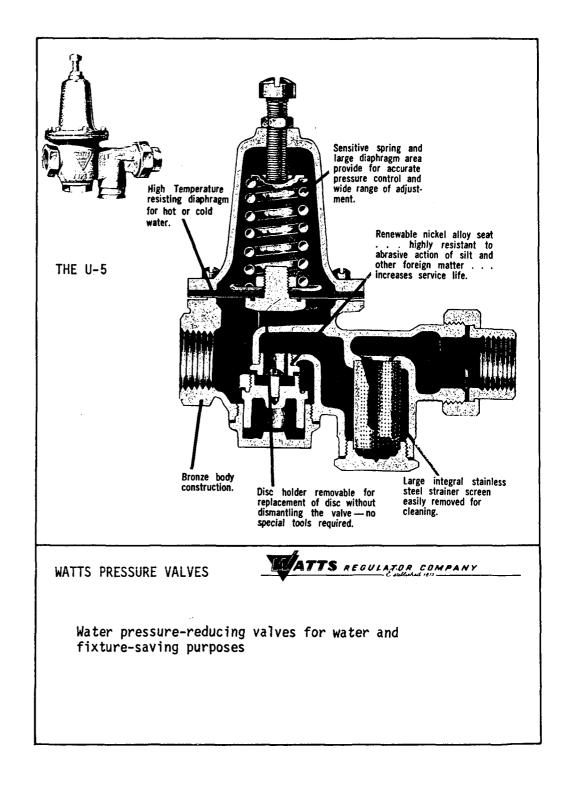
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| D.                                                                                                              | AYTON<br>13) 224                                                                                 |                                                                                                    | T.<br>45401                                                                                           | Krebs, f                                                                                                                                                       | Exec. Vice                                                               | President                                                                                                       |                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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|                                                                                                      | LO RS-1                                       |     |
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| as<br>2. For<br>dis<br>3. Sub<br>tra<br>4. Sec<br>tra<br>5. Opt                                                 | igle sei<br>flushir<br>use wi<br>scharge<br>merged<br>ition in<br>cond tar<br>eatment<br>tional  | ng fluid<br>is difi<br>motor-d<br>n main h<br>hk has d<br>inlet fo<br>lischarg                     | d to dis<br>ter is i<br>ficult.<br>diffused<br>tank.<br>charcoal<br>or other                          | pose of<br>n short<br>aerati<br>filter<br>househ                                                                                                               | system re<br>human wa<br>supply o<br>on and po<br>for colo<br>old waste  | ste.<br>r where s<br>sitive ef<br>r removal                                                                     | ewage liq<br>fluent fi<br>and furt                                          | uent) 1<br>uid<br>t- 2<br>her                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2. Water f<br>aerated<br>3. Dischar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | is flushed<br>rom toilet<br>, filtered<br>ge from cha                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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filter<br>discharged.                                                                   | r optional)<br>ctivated cha                                                                          | flows to tani<br>rcoal filter.                | •   |
|                                                                                                                 | <b>r</b>                                                                                         | DIMENSIO                                                                                           |                                                                                                       |                                                                                                                                                                |                                                                          | r                                                                                                               | r                                                                           |                                                                                                                                                          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| MODEL<br>NURBER<br>(MAJORI)                                                                                     | LENGTH                                                                                           | WIDTH                                                                                              | HEIGHT                                                                                                | WEIGHT                                                                                                                                                         | RATED<br>CAPACITY<br>(GPD) 1                                             | TANK<br>CAPACITY<br>(GAL.)                                                                                      | SUGG. 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| RS-13                                                                                                           | 54"                                                                                              | 39"                                                                                                | 77"                                                                                                   | 680                                                                                                                                                            | 300                                                                      | 300                                                                                                             | 1421                                                                        | Varies                                                                                                                                                   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| RS-15                                                                                                           | 72"                                                                                              | 61"                                                                                                | 77"                                                                                                   | 825                                                                                                                                                            | 500                                                                      | 500                                                                                                             | 1621                                                                        | •                                                                                                                                                        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| Carbon<br>Filter                                                                                                | 14"                                                                                              | 14"                                                                                                | 48"                                                                                                   |                                                                                                                                                                |                                                                          |                                                                                                                 |                                                                             |                                                                                                                                                          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| Filter<br>SIZING<br>1. RS-<br>RS-<br>2. Mor<br>COSTS                                                            | & GROW<br>1-0.3 s<br>1-0.5 f<br>re toils                                                         | VTH PO<br>uitable<br>or 25 p<br>ets can                                                            | TENTIA<br>e for 15<br>beople w<br>be adde                                                             | people<br>ith pea<br>d to sy                                                                                                                                   | with pea<br>ks to 40<br>stem with                                        | total.<br>in range                                                                                              | s to 24 t<br>of capaci                                                      | ty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | STALLATI<br>. 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MAINTE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ith 6" cleara<br>on with fine<br>y.<br>an skills req<br>harge connect<br>NANCE RECU                                                            | sand or pea<br>quired for in<br>tions; 3" pij<br><b>UIREMENTS</b>                                    | gravel base.<br>nstallation.<br>pe - air inta | ke  |
| Filter<br>SIZING<br>1. RS-<br>RS-<br>2. Mor<br>COSTS<br>1. Cus                                                  | & GROW<br>1-0.3 s<br>1-0.5 f<br>e toile<br>tomer c<br>ctrical<br>orinati                         | VTH PO<br>uitable<br>or 25 p<br>ets can<br>or insta<br>work.<br>on or p                            | TENTIA<br>a for 15<br>beople w<br>be added<br>aller fur<br>basteuri                                   | people<br>ith pea<br>d to sy<br>rnishes<br>zation                                                                                                              | with pea<br>ks to 40<br>stem with<br>intercon<br>equipment               | k loading<br>total.<br>in range<br>necting p                                                                    | s to 24 t<br>of capaci<br>iping and                                         | ty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | STALLATI<br>. 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MAINTE</b><br>ear: free<br>ystem.<br>r local sem<br>nal pumping                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ith 6" cleara<br>on with fine<br>y.<br>an skills req                                                                                           | sand or pea<br>quired for in<br>tions; 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| Filter<br>SIZING<br>1. RS-<br>RS-<br>2. Mor<br>COSTS<br>1. Cus<br>ele<br>2. Chl                                 | E GROW<br>1-0.3 s<br>1-0.5 f<br>e toile<br>tomer c<br>ctrical<br>orinati<br>(R-3)                | WTH PO<br>uitable<br>or 25 p<br>ets can<br>or insta<br>work.<br>on or p                            | TENTIA<br>a for 15<br>beople w<br>be adden<br>aller fun<br>basteuri<br>RFORMAN<br>100, A - A          | people<br>ith pea<br>d to sy<br>rnishes<br>zation<br>CEOUTPH<br>CTUAL V                                                                                        | with peaks to 40<br>stem with<br>intercon<br>equipment                   | k loading<br>total.<br>in range<br>necting p<br>availabl<br>OPERATH<br>RANGES                                   | s to 24 t<br>of capaci<br>iping and<br>e.                                   | orse                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | STALLATI<br>1. 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Ch1<br>MODEL                        | E GROW<br>1-0.3 s<br>1-0.5 f<br>e toils<br>tomer c<br>ctrical<br>orinati                         | VTH PO<br>uitable<br>or 25 p<br>ets can<br>work.<br>on or p<br>NICAL PE<br>REOUCT                  | TENTIA<br>e for 15<br>beople w<br>be adden<br>aller fun<br>basteuri                                   | people<br>ith pea<br>d to sy<br>rnishes<br>zation<br>CE-QUTPH<br>CTUAL V.<br>p HAT                                                                             | with peaks to 40<br>stem with<br>intercon<br>equipment<br>ER<br>DR<br>to | k loading<br>total.<br>in range<br>necting p<br>availabl                                                        | s to 24 t<br>of capaci<br>iping and<br>e.<br>ken o<br>Low                   | 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| STALLATI<br>Den ex<br>at prop<br>Backfil<br>Plumber<br>B 4" inle<br>ERATION<br>First y<br>alarm s;<br>Call fo<br>Casio<br>Dischard<br>STANDARD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | cavation w<br>er elevation<br>l uniform]<br>/electricia<br>t and disc'<br><b>&amp; MAINTE</b><br>ear: free o<br>ystem.<br>r local sei<br>nal pumping<br>e arrangem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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fine<br>y.<br>an skills req<br>anarge connect<br><b>NANCE RECN</b><br>quarterly ins<br>rvice if nece<br>g out require | sand or pea<br>quired for in<br>tions; 3" pin<br><b>UIREMENTS</b><br>spections to<br>essary.<br>ad.  | gravel base.<br>nstallation.<br>pe - air inta | ke. |
| Filter<br>SIZING<br>1. RS-<br>RS-<br>2. Mor<br>COSTS<br>1. Cus<br>ele<br>2. Ch1<br>MODEL<br>NUMBER<br>(MAJOR)   | E GROW<br>1-0.3 s<br>1-0.5 f<br>e toile<br>tomer c<br>ctrical<br>orinati<br>(n-3<br>BOD<br>(n) 5 | VTH PO<br>uitable<br>or 25 p<br>ets can<br>work.<br>on or p<br>NICAL PE<br>REOUCT                  | TENTIA<br>a for 15<br>beople w<br>be added<br>aller fur<br>basteuri<br>RFORMAN<br>100, A - A<br>00 CO | people<br>ith pea<br>d to sy<br>rnishes<br>zation<br>CE-OUTPH<br>CTUAL V.<br>O WAT                                                                             | with peaks to 40<br>stem with<br>intercon<br>equipment<br>ER<br>DR<br>to | k loading<br>total.<br>in range<br>necting p<br>availabl<br>OPERATHI<br>RANGEE<br>(TEMP, OTH<br>Normal          | s to 24 t<br>of capaci<br>iping and<br>e.<br>ken o<br>Low                   | ty.<br>a constant of the second                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | STALLATI<br>I. Open ex<br>at prop<br>Backfil<br>. Plumber<br>ERATION<br>. First y<br>alarm s.<br>. Call for<br>. Call for<br>. Call for<br>. Call for<br>. Call for<br>. Call constant<br>STANDARCE<br>CODES MET<br>NAS-NRC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | cavation w<br>er elevation<br>l uniform]<br>/electricia<br>t and disc'<br><b>&amp; MAINTE</b><br>ear: free o<br>ystem.<br>r local sei<br>nal pumping<br>e arrangem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ith 6" cleara<br>on with fine<br>y.<br>an skills req<br>anarge connect<br><b>NANCE RECN</b><br>quarterly ins<br>rvice if nece<br>g out require | sand or pea<br>quired for in<br>tions; 3" pin<br><b>UIREMENTS</b><br>spections to<br>essary.<br>ad.  | gravel base.<br>nstallation.<br>pe - air inta | ke  |
| Filter<br>SIZING<br>1. RS-<br>2. Mor<br>COSTS<br>1. Cus<br>ele<br>2. Chl<br>MODEL<br>NUMMER<br>(MAJOR)<br>RS-13 | E GROW<br>1-0.3 s<br>1-0.5 f<br>e toile<br>tomer c<br>ctrical<br>orinati<br>(n-3<br>BOD<br>(n) 5 | VTH PO<br>uitable<br>or 25 p<br>ts can<br>or insta<br>work.<br>on or p<br>NICAL PE<br>REDUCT<br>SE | TENTIA<br>a for 15<br>beople w<br>be added<br>aller fun<br>basteuri<br>RFORMAN<br>100, A - A<br>po co | people<br>ith pea<br>d to sy<br>rnishes<br>zation<br>CE-OUTPH<br>CTUAL V.<br>P FL<br>UP<br>40<br>                                                              | with peaks to 40<br>stem with<br>intercon<br>equipment<br>ER<br>DR<br>to | k loading<br>total.<br>in range<br>necting p<br>availabl<br>OPERATHI<br>RANGEE<br>(TEMP, OTH<br>Normal          | s to 24 t<br>of capaci<br>iping and<br>e.<br>ken o<br>Low                   | ty.<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Cons | STALLATI<br>J. Open exact prop<br>Backfil<br>Plumber<br>Backfil<br>Plumber<br>ERATION<br>Coll for<br>Codes net<br>STANDARDA<br>CODES MET<br>NAS-NRC<br>Publn, 58                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | cavation w<br>er elevation<br>l uniform]<br>/electricia<br>t and disc'<br><b>&amp; MAINTE</b><br>ear: free o<br>ystem.<br>r local sei<br>nal pumping<br>e arrangem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ith 6" cleara<br>on with fine<br>y.<br>an skills req<br>anarge connect<br><b>NANCE RECN</b><br>quarterly ins<br>rvice if nece<br>g out require | sand or pea<br>quired for in<br>tions; 3" pin<br><b>UIREMENTS</b><br>spections to<br>essary.<br>ad.  | gravel base.<br>nstallation.<br>pe - air inta | ke. |
| Filter<br>SIZING<br>1. RS-<br>2. Mor<br>COSTS<br>1. Cus<br>ele<br>2. Chl<br>MODEL<br>NUMMER<br>(MAJOR)<br>RS-13 | E GROW<br>1-0.3 s<br>1-0.5 f<br>e toile<br>tomer c<br>ctrical<br>orinati<br>(n-3<br>BOD<br>(n) 5 | VTH PO<br>uitable<br>or 25 p<br>ts can<br>or insta<br>work.<br>on or p<br>NICAL PE<br>REDUCT<br>SE | TENTIA<br>a for 15<br>beople w<br>be added<br>aller fun<br>basteuri<br>RFORMAN<br>100, A - A<br>po co | people<br>ith pea<br>d to sy<br>rnishes<br>zation<br>CE-OUTPH<br>CTUAL V.<br>P FL<br>UP<br>40<br>                                                              | with peaks to 40<br>stem with<br>intercon<br>equipment<br>ER<br>DR<br>to | k loading<br>total.<br>in range<br>necting p<br>availabl<br>OPERATHI<br>RANGEE<br>(TEMP, OTH<br>Normal          | s to 24 t<br>of capaci<br>iping and<br>e.<br>ken o<br>Low                   | ty.<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Conse<br>Cons | STALLATI<br>J. Open exact prop<br>Backfil<br>Plumber<br>Backfil<br>Plumber<br>ERATION<br>Coll for<br>Codes net<br>STANDARDA<br>CODES MET<br>NAS-NRC<br>Publn, 58                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | cavation w<br>er elevation<br>l uniform]<br>/electricia<br>t and disc'<br><b>&amp; MAINTE</b><br>ear: free o<br>ystem.<br>r local sei<br>nal pumping<br>e arrangem                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ith 6" cleara<br>on with fine<br>y.<br>an skills req<br>anarge connect<br><b>NANCE RECN</b><br>quarterly ins<br>rvice if nece<br>g out require | sand or pea<br>quired for in<br>tions; 3" pin<br><b>UIREMENTS</b><br>spections to<br>essary.<br>ad.  | gravel base.<br>nstallation.<br>pe - air inta | ke  |
| Filter<br>SIZING<br>1. RS-<br>2. Mor<br>COSTS<br>1. Cus<br>ele<br>2. Chl<br>MODEL<br>NUMMER<br>(MAJOR)<br>RS-13 | E GROW<br>1-0.3 s<br>1-0.5 f<br>e toile<br>tomer c<br>ctrical<br>orinati<br>(n-3<br>BOD<br>(n) 5 | VTH PO<br>uitable<br>or 25 p<br>ts can<br>or insta<br>work.<br>on or p<br>NICAL PE<br>REDUCT<br>SE | TENTIA<br>a for 15<br>be adde<br>aller fu<br>pool of the start<br>reonana<br>bo<br>to of<br>ppm<br>-  | people<br>ith pea<br>d to sy<br>rnishes<br>zation<br>CE-OUTPH<br>CTUAL V.<br>0 WAT<br>0 40<br>100<br>100<br>100<br>100<br>100<br>100<br>100<br>100<br>100<br>1 | with peaks to 40<br>stem with<br>intercon<br>equipment<br>ER<br>DR<br>to | k loading<br>total.<br>in range<br>necting p<br>availabl<br>OPERATH<br>RANGEE<br>TREM, OTH<br>Normal<br>Domesti | s to 24 t<br>of capaci<br>iping and<br>e.<br>Keen Q<br>Low<br>c noi<br>c No | orse<br>cons<br>see. 3<br>dors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | STALLATI<br>. Open ex<br>at prop<br>Backfil<br>. Plumber<br>. Plumber<br>. A" inle<br>ERATION<br>. Call for<br>. Call fo | cavation w<br>er elevation<br>/ uniforml;<br>/electricit<br>t and discutricit<br>t and discutricit<br>demain free<br>/ stem.<br>r local se<br>r local se<br>r local se<br>se<br>se<br>se<br>se<br>se<br>se<br>se<br>se<br>se<br>se<br>se<br>se<br>s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ith 6" cleara<br>on with fine<br>y.<br>an skills req<br>anarge connect<br><b>NANCE RECN</b><br>quarterly ins<br>rvice if nece<br>g out require | sand or pea<br>quired for in<br>tions; 3" pit<br>UIREMENTS<br>spections to<br>essary.<br>ed.<br>rry. | gravel base.<br>nstallation.<br>pe - air inta | ke  |





| (51                                                                                                      | YTON<br>3) 224<br>Attn                                                                               |                                                                                          | 45401                                                                                           | Krebs, I                                                                                                               | Exec. Vice                                                                           | -President                                                                                               |                                                                               |                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                          | RECYC                                                                                                                                  |                                                                                                     | NDED AERAT                                                                   |             |
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| hou<br>flu<br>2. Fir<br>flu<br>fir<br>3. For<br>dis<br>4. Sub<br>fil                                     | l sewag<br>sehold<br>id for<br>st tank<br>shing;<br>st tank<br>use wh<br>charge<br>nerged<br>tratior | wastewa<br>toilets<br>collec<br>second<br>overf<br>ere was<br>is diff<br>motors<br>in bo | ater <u>exc</u><br>5.<br>tas hous<br>tank ta<br>low for<br>ter is i<br>ficult.                  | ept toi<br>ehold w<br>kes toi<br>dischar<br>n short<br>ed aera                                                         | let ("gre<br>maste wate<br>let waste<br>ge.<br>supply c<br>tion and                  | ey" water)<br>ers which<br>es ("black                                                                    | er from al<br>as flush<br>are used<br>("waters)<br>sewage liq<br>effluent     | 1<br>ing<br>for 2<br>and                     | tank an<br>collect<br>2. Water i:<br>flushin<br>3. Toilet i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | d are aera<br>ion tank.<br>n collecti<br>g, overflo<br>waters are                                                                                                        | ted, filtered<br>on tank is pu<br>v goes to sev                                                                                        | d, pass over<br>umped (30 PS)<br>wage tank<br>wage tank, ag                                         | flow into was<br>weir to effl<br>l) to toilet<br>erated, filte<br>on.        | uent<br>for |
|                                                                                                          |                                                                                                      | MMENSIO                                                                                  | *4                                                                                              | <u> </u>                                                                                                               |                                                                                      |                                                                                                          | Γ α                                                                           |                                              | ARI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <u> </u>                                                                                                                                                                 |                                                                                                                                        | OUIREMENTS                                                                                          | T                                                                            |             |
| MODEL<br>NUMBER<br>(MAJORI                                                                               | LENGTH                                                                                               | ·                                                                                        | HEIGHT                                                                                          | WEIGHT                                                                                                                 | RATED<br>CAPACITY<br>(GPO)                                                           | TANK<br>CAPACITY<br>(GAL.)                                                                               | SUGO. LIST<br>(FOE<br>FACTORY)                                                | INSTALL<br>COST                              | OPERATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | DESIGN<br>LIFETIME<br>(VRL)                                                                                                                                              | ELECTRICITY<br>(RATING)                                                                                                                |                                                                                                     | OPERATING<br>SUPPLIES                                                        |             |
| RS-23                                                                                                    | 120"                                                                                                 | 39"                                                                                      | 77"                                                                                             | 1030                                                                                                                   | 300                                                                                  | 300                                                                                                      | 2421                                                                          | 300-500                                      | 8-11/<br>month                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 3-5                                                                                                                                                                      | 115 V AC<br>3/4 Kw                                                                                                                     |                                                                                                     | None                                                                         |             |
| R5-25                                                                                                    | 160"                                                                                                 | 61"                                                                                      | 77*                                                                                             | 1325                                                                                                                   | 500                                                                                  | 500                                                                                                      | 2821                                                                          |                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | "                                                                                                                                                                        |                                                                                                                                        |                                                                                                     |                                                                              |             |
| Pump                                                                                                     | 24"                                                                                                  | 24"                                                                                      | 22"                                                                                             | <b> </b>                                                                                                               |                                                                                      | ļ                                                                                                        | ļ                                                                             |                                              | <u> </u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                          |                                                                                                                                        |                                                                                                     |                                                                              |             |
| Storage                                                                                                  | 14"                                                                                                  | 14"                                                                                      | 48"                                                                                             |                                                                                                                        |                                                                                      | 1                                                                                                        |                                                                               |                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                          |                                                                                                                                        | 1                                                                                                   | I                                                                            |             |
| Tank<br>SIZING 8<br>1. RS-:<br>RS-:<br>COSTS<br>1. Cust<br>eler                                          | GROW<br>23 fc<br>25 fc<br>tomer o                                                                    | r insta<br>work.                                                                         | D people<br>D people<br>siler fu                                                                | , peak<br>, peak<br>rnishes                                                                                            | loadings<br>loadings                                                                 | to 40 tot<br>to 60 tot<br>inecting p                                                                     | tal;<br>tal.<br>oiping and                                                    | OP                                           | at prop<br>Backfil<br>2. Plumber<br>3. 4" inle<br>ERATION<br>1. First y<br>alarm 5<br>2. Call fo<br>3. Occasio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | cavation w<br>er elevation<br>l uniformi<br>/electrici<br>t and disci<br><b>a MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin                              | ith 6" clears<br>on with fine<br>y.<br>an skills rec<br>narge connect<br>NANCE REQU<br>quarterly ins<br>rvice if neco<br>g out require | sand or pea<br>quired for in<br>tions; 3" pij<br><b>JIREMENTS</b><br>spections to<br>essary.<br>ed. | tanks. Level<br>gravel base.<br>nstallation.<br>pe - air inta<br>note odors, | ke.         |
| Tank<br>SIZING 8<br>1. RS-1<br>RS-1<br>COSTS<br>1. Cust<br>elet<br>2. Chlo                               | GROV<br>23 fc<br>25 fc<br>tomer c<br>ctrical<br>prinati                                              | TH PO<br>In 15-24<br>r 30-44<br>work.<br>on ar p                                         | D people<br>D people<br>Aller fu<br>pasteuri                                                    | rnishes                                                                                                                | loadings<br>loadings<br>intercor<br>equipment                                        | to 40 tot<br>to 60 tot<br>nnecting p<br>t availabl                                                       | tal;<br>tal;<br>biping and<br>le.                                             |                                              | <ol> <li>Open exat prop<br/>abckfil</li> <li>Plumber.</li> <li>4" inle</li> <li>ERATION</li> <li>First y</li> <li>alarm s.</li> <li>Call fo</li> <li>Occasio</li> <li>Dischar</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | cavation w<br>er elevati<br>l uniformi<br>(electrici<br>t and disc<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange               | ith 6° clears<br>on with fine<br>y.<br>an skills rec<br>harge connect<br>NANCE REQU<br>quarterly in                                    | sand or pea<br>quired for in<br>tions; 3" pij<br><b>JIREMENTS</b><br>spections to<br>essary.<br>ed. | gravel base.<br>nstallation.<br>pe - air inta                                | ke.         |
| Tank<br>SIZING 8<br>1. RS-:<br>RS-:<br>COSTS<br>1. Cust                                                  | tomer of<br>ctrical<br>rinati                                                                        | r insta<br>work.<br>on or p                                                              | D people<br>D people<br>Biller fu<br>pasteuri<br>ION, A - A                                     | rnishes<br>zation                                                                                                      | loadings<br>loadings<br>intercor<br>equipment<br>ur<br>ALUE)                         | to 40 tot<br>to 60 tot                                                                                   | tal;<br>tal.<br>biping and<br>le.                                             | OP                                           | <ol> <li>Open exact prop<br/>Backfil</li> <li>Plumber</li> <li>4" inle</li> <li>ERATION</li> <li>First yang</li> <li>Call foil</li> <li>Occasio</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | cavation w<br>er elevati<br>l uniformi<br>(electrici<br>t and disci<br><b>&amp; MAINTE</b><br>ear: free<br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange | ith 6" clears<br>on with fine<br>y.<br>an skills rec<br>narge connect<br>NANCE REQU<br>quarterly ins<br>rvice if neco<br>g out require | sand or pea<br>quired for in<br>tions; 3" pij<br><b>JIREMENTS</b><br>spections to<br>essary.<br>ed. | gravel base.<br>nstallation.<br>pe - air inta                                | ke.         |
| SIZING 8<br>1. RS-<br>RS-<br>COSTS<br>1. Cust<br>elet<br>2. Child<br>MODEL<br>NUMBER                     | GROV<br>23 fc<br>25 fc<br>tomer c<br>ctrical<br>prinati                                              | TH PO<br>r 15-21<br>r 30-41<br>work.<br>on or p<br>REDUCT                                | D people<br>D people<br>Biller fu<br>pasteuri<br>NFORMAR                                        | rnishes<br>zation<br>CE-OUTP<br>CTUAL V<br>D<br>HAT                                                                    | loadings<br>loadings<br>intercor<br>equipment<br>ur<br>ALUEI<br>ER<br>ER<br>ER<br>ER | to 40 tot<br>to 60 tot<br>mecting p<br>t availabl<br>OPERATI<br>RANGE                                    | tal;<br>tal;<br>tal.<br>biping and<br>le.<br>NG N<br>S<br>NER) C<br>LOW<br>NO | OP<br>OP<br>BOORS<br>SQ.                     | 1. Open ex<br>at prop<br>Backfil<br>2. Plumber<br>3. 4" inle<br><b>ERATION</b><br>1. First y<br>alarm s<br>2. Call fo<br>3. Occasio<br>4. Dischar                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | cavation w<br>er elevati.<br>/electrici:<br>t and disci<br>& MAINTE<br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange                                     | ith 6" clears<br>on with fine<br>y.<br>an skills rec<br>narge connect<br>NANCE REQU<br>quarterly ins<br>rvice if neco<br>g out require | sand or pea<br>quired for in<br>tions; 3" pij<br><b>JIREMENTS</b><br>spections to<br>essary.<br>ed. | gravel base.<br>nstallation.<br>pe - air inta                                | ke.         |
| Tank<br>SIZING 8<br>1. RS-<br>RS-<br>COSTS<br>1. Cust<br>elter<br>2. Chlo<br>MODEL<br>MURADER<br>MURADER | GROW<br>23 fc<br>25 fc<br>tomer o<br>ctrical<br>prinati<br>(R-1<br>5000<br>INIS                      | r insta<br>work.<br>on or j                                                              | D people<br>D people<br>siller fu<br>pasteuri<br>ION A - A<br>ION CO<br>(A) CO                  | rnishes<br>zation<br>CE-OUTP<br>CTUAL V<br>D<br>HAT                                                                    | loadings<br>loadings<br>intercor<br>equipment<br>tr<br>tr<br>M<br>to                 | to 40 tot<br>to 60 tot<br>unecting p<br>t availabl<br>OPERATI<br>RANGE<br>(TEMP, OT<br>Normal            | tal;<br>tal;<br>tal.<br>biping and<br>le.<br>NG N<br>S<br>NER) C<br>LOW<br>NO | COP<br>B B B B B B B B B B B B B B B B B B B | 1. Open ex<br>at prop<br>Backfill<br>2. Plumber,<br>3. 4" inle<br><b>ERATION</b><br>1. First y<br>alarm s<br>2. Call fo<br>3. Occasio<br>4. Dischar<br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b><br><b>STANDARDS</b> | cavation w<br>er elevati.<br>/electrici:<br>t and disci<br>& MAINTE<br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange                                     | ith 6" clears<br>on with fine<br>y.<br>an skills rec<br>narge connect<br>NANCE REQU<br>quarterly ins<br>rvice if neco<br>g out require | sand or pea<br>quired for in<br>tions; 3" pij<br><b>JIREMENTS</b><br>spections to<br>essary.<br>ed. | gravel base.<br>nstallation.<br>pe - air inta                                | ke.         |
| Tank<br>SIZING 8<br>1. RS-<br>RS-<br>COSTS<br>1. Cust<br>elet<br>2. Chlo<br>NGMER<br>(MAJOR)<br>RS-23    | Comer of<br>tomer of<br>torical<br>prinati<br>(R = 3<br>90                                           | r insta<br>work.<br>on or p                                                              | D people<br>D people<br>siller fu<br>pasteuri<br>ION A - A<br>ION CO<br>(A) CO                  | rnishes<br>zation<br>CTUAL V<br>D<br>HAT<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40<br>40 | loadings<br>loadings<br>intercor<br>equipment<br>ur<br>ALUEI<br>ER<br>ER<br>ER<br>ER | to 40 tot<br>to 60 tot<br>mecting p<br>t availabl<br>OPERATI<br>RANGE<br>(TEMP, OT<br>Normal<br>Domestic | tal;<br>tal;<br>tal.<br>biping and<br>le.<br>No.<br>No.<br>No.                | COP<br>B B B B B B B B B B B B B B B B B B B | 1. Open ex<br>at prop<br>Backfil<br>2. Plumber<br>3. 4" inle<br><b>ERATION</b><br>1. First y<br>alarm 5<br>2. Call fo<br>3. Occasio<br>4. Dischar<br><b>STANDARCE</b><br><b>CODES MET</b><br>NAS-NRC<br>Publn, 58                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | cavation w<br>er elevati.<br>/electrici:<br>t and disci<br><b>&amp; MAINTE</b><br>ear: free<br>ystem.<br>r local se<br>nal pumpin<br>ge arrange                          | ith 6" clears<br>on with fine<br>y.<br>an skills rec<br>narge connect<br>NANCE REQU<br>quarterly ins<br>rvice if neco<br>g out require | sand or pea<br>quired for in<br>tions; 3" pij<br><b>JIREMENTS</b><br>spections to<br>essary.<br>ed. | gravel base.<br>nstallation.<br>pe - air inta                                | ke.         |
| Tank<br>SIZING 8<br>1. RS-<br>RS-<br>COSTS<br>1. Cust<br>elet<br>2. Chlo<br>NGMER<br>(MAJOR)<br>RS-23    | Comer of<br>tomer of<br>torical<br>prinati<br>(R = 3<br>90                                           | r insta<br>work.<br>on or p                                                              | D people<br>D people<br>siller fu<br>pasteuri<br>RFORMAA<br>1004, A - A<br>900 CC<br>4-6<br>ppm | , peak<br>, peak<br>, peak<br>rnishes<br>zation<br>CTUAL v<br>MAN<br>FLC<br>Up<br>40<br>                               | loadings<br>loadings<br>intercor<br>equipment<br>tr<br>to<br>12                      | to 40 tot<br>to 60 tot<br>inecting p<br>t availabl<br>OPERATI<br>TRAMOUT<br>Normal<br>Domestic           | tal;<br>tal;<br>tal.<br>biping and<br>le.<br>No.<br>No.<br>No.                | oorse 3<br>boonse 3<br>se.<br>odors.         | 1. Open ex<br>at prop<br>Backfil<br>2. Plumber<br>3.4" inle<br>ERATION<br>1. First y<br>alarm s<br>2. Call for<br>3. Occasio<br>4. Dischar<br>ETANDARD:<br>ETANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TANDARD:<br>TAND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | cavation w<br>er elevati<br>1 uniformi<br>/electrici<br>& MAINTE<br>& and discu<br>& MAINTE<br>ear: free<br>ystem.<br>r local se<br>ral pumpin<br>ge arrange<br>6        | ith 6" clears<br>on with fine<br>y.<br>an skills rec<br>narge connect<br>NANCE REQU<br>quarterly ins<br>rvice if neco<br>g out require | sand or pea<br>quired for in<br>tions; 3" un<br>UIREMENTS<br>spections to<br>essary.<br>ed.<br>ary. | gravel base.<br>nstallation.<br>pe - air inta                                | ke.         |



| 3. Uni<br>4. Ins<br>5. Sav                                                                                               | ES<br>inze bo<br>egral<br>on fit<br>talled<br>ves wat                                                   | dies.<br>straine<br>tings.<br>at hou                                                                        | ers.<br>Ise ini<br>reducii                                         | et down                                                                                     | <b>Advortising</b>                                                        | lawn-water                                                                                                   |                                                  | ff.                                                                                  | pounds<br>Reduced<br>the set<br>meet de                                                                                            | es from wa<br>to reduced<br>pressure<br>-point (e.<br>mands of a                                                                                                                        | ter main pres<br>pressures (a<br>in the system<br>a., 50 PSI) a                                                                                                                                                                                       | ssures of up<br>adjustable)<br>n will be fuu<br>as increasin<br>This "reduce                                                                                                                       | to several h<br>in 50 PSI ran<br>rther reduced<br>g volumes flo<br>d pressure fa                                                              | undred<br>ige.<br>from<br>w to |
|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                                                                                                                          | <b></b>                                                                                                 | DIMENSI                                                                                                     |                                                                    |                                                                                             |                                                                           | <u> </u>                                                                                                     |                                                  |                                                                                      |                                                                                                                                    |                                                                                                                                                                                         |                                                                                                                                                                                                                                                       | QUIREMENTS                                                                                                                                                                                         | ·                                                                                                                                             | <b></b>                        |
| MODEL<br>NUMBER<br>(MAJOR)                                                                                               | LENGTH                                                                                                  | 7                                                                                                           | <b>7</b>                                                           | WEIG                                                                                        |                                                                           | TANK<br>CAPACITY<br>(GAL.)                                                                                   | SUGG. LIST                                       |                                                                                      | OPERATE                                                                                                                            | DESIGN<br>LIFETIME<br>(YRL)                                                                                                                                                             | ELECTRICITY<br>(RATING)                                                                                                                                                                                                                               | WATER                                                                                                                                                                                              | OPERATING<br>SUPPLIES                                                                                                                         |                                |
| V5                                                                                                                       | 5 <sup>3</sup> to<br>11"                                                                                |                                                                                                             | 57<br>81                                                           | 0<br>1" 3-1                                                                                 | <u> </u>                                                                  | NA                                                                                                           | FACTORY)<br>\$14.70<br>to<br>\$90.75             |                                                                                      |                                                                                                                                    |                                                                                                                                                                                         | None                                                                                                                                                                                                                                                  | Up to<br>300 PSI<br>at inlet                                                                                                                                                                       |                                                                                                                                               |                                |
| U5LP                                                                                                                     | "                                                                                                       |                                                                                                             |                                                                    |                                                                                             |                                                                           | "                                                                                                            | \$15.45<br>to<br>\$95.30                         |                                                                                      |                                                                                                                                    |                                                                                                                                                                                         | "                                                                                                                                                                                                                                                     | Up to<br>200 PSI<br>at inlet                                                                                                                                                                       |                                                                                                                                               |                                |
| U135                                                                                                                     | $\frac{5\frac{3}{4}t0}{11\frac{1}{2}}$                                                                  | 85                                                                                                          | 81                                                                 | 5" 4-:<br>8                                                                                 | 30 19                                                                     |                                                                                                              | \$16.00<br>to<br>\$118.05<br>\$17.65             |                                                                                      |                                                                                                                                    |                                                                                                                                                                                         | n .                                                                                                                                                                                                                                                   | Up to<br>300 PSI<br>at inlet                                                                                                                                                                       |                                                                                                                                               |                                |
| 2235                                                                                                                     | 16 <mark>5</mark>                                                                                       | 2 4                                                                                                         | 19                                                                 | 1" 5-1<br>4                                                                                 | <u> </u>                                                                  | <u> </u>                                                                                                     | to<br>\$142.00                                   | <u> </u>                                                                             |                                                                                                                                    |                                                                                                                                                                                         | f-inch lines                                                                                                                                                                                                                                          | 250 PSI<br>at inlet                                                                                                                                                                                | <b>I</b>                                                                                                                                      |                                |
| <sup>2</sup> In 0.<br><b>SIZING 8</b><br>1. U5<br>sch<br><b>COSTS</b><br>1. Tra<br>\$26                                  | 5" lin<br>recomm<br>ools,<br>de pri                                                                     | es at 2<br>WTH PC<br>ended 1<br>etc.<br>ces of<br>r 1" si                                                   | US are<br>zes (†                                                   | reduced<br>IAL<br>identia<br>\$14.70<br>ome siz                                             | d pressure<br>al use; 223:<br>0 for 0.5",<br>res).                        | f <u>all-off,</u><br>S sized fo<br>\$16.65 fo                                                                | i.e., 20<br>pr motels,<br>pr 0.75",              | and 1                                                                                | pressure<br>STALLATI<br>US, USL<br>Install<br>ERATION<br>Once se<br>other ti                                                       | loss (due<br>ON REQUI<br>P, UI35 ha<br>ation shou<br>& MAINTE<br>t to desirn<br>han cleani                                                                                              | to demand) of<br><b>REMENTS</b><br>ve union.<br>1d take 15-30<br><b>NANCE REOM</b><br>ed outlet pre-<br>ng strainer 1                                                                                                                                 | n house side<br>O minutes for<br><b>UIREMENTS</b><br>essure, requi<br>(perhaps once                                                                                                                | r home size.<br>ires no atter<br>e a year, dep                                                                                                | ending                         |
| 2In 0.<br>SIZING 2<br>1. U5<br>sch<br>COSTS<br>1. Ira<br>\$26<br>2. Bui<br>3%                                            | 5" lin<br><b>GRO</b><br>recomme<br>cols,<br>de pri<br>.05 fo<br>lt-in<br>extra.                         | es at 2<br>WTH PC<br>ended f<br>etc.<br>ces of<br>r 1" si<br>by-pass                                        | US are<br>zes (†<br>featu                                          | reduce<br>IAL<br>identia<br>\$14.70<br>ome sia<br>re (for                                   | d pressure<br>al use; 223<br>D for 0.5",<br>res).<br>r thermal e:         | f <u>all-off,</u><br>S sized fo<br>\$16.65 fo                                                                | i.e., 20<br>pr motels,<br>pr 0.75",              | and 1                                                                                | pressure<br>STALLATI<br>US, USL<br>Install<br>ERATION<br>Once se<br>other ti                                                       | loss (due<br>ON REQUI<br>P, UI35 ha<br>ation shou<br>& MAINTE<br>t to desirn<br>han cleani                                                                                              | to demand) of<br><b>REMENTS</b><br>ve union.<br>1d take 15-30<br><b>NANCE REOM</b><br>ed outlet pre-<br>ng strainer 1                                                                                                                                 | n house side<br>O minutes for<br><b>UIREMENTS</b><br>essure, requi<br>(perhaps once                                                                                                                | r home size.<br>ires no atten                                                                                                                 | ending                         |
| 2In 0.<br>SIZING 8<br>1. U5<br>sch<br>COSTS<br>1. Ira<br>\$26<br>2. Bui<br>3%<br>MODEL<br>NUMBER                         | 5" lin<br><b>GRO</b><br>recommender<br>cols,<br>de pri<br>.05 fo<br>lt-in<br>extra.<br>(R = 1)          | es at 2<br>WTH PC<br>ended 1<br>etc.<br>ces of<br>r 1" si<br>by-pass                                        | US are<br>zes (†<br>featu                                          | reduced<br>identia<br>\$14.70<br>ome siz<br>re (for<br>ANCE-OL                              | d pressure<br>al use; 223<br>D for 0.5",<br>res).<br>r thermal e:         | fall-off,<br>S sized fo<br>\$16.65 fo<br>xpansion)<br>OPERATI<br>RANGE                                       | i.e., 20<br>or motels,<br>or 0.75",<br>costs abo | and 1                                                                                | pressure<br>STALLATI<br>US, USL<br>Install<br>ERATION<br>Once se<br>other ti                                                       | 1055 (due<br>ON REQUI<br>P, UI35 har<br>ation shou<br>& MAINTE<br>t to desirn<br>han cleanin<br>r quality)<br>PRES<br>(A11                                                              | to demand) of<br><b>REMENTS</b><br>ve union.<br>1d take 15-30<br><b>NANCE REOM</b><br>ed outlet pre-<br>ng strainer 1                                                                                                                                 | n house side<br>O minutes fo<br>UIREMENTS<br>essure, requ<br>(perhaps onc.<br>e check (peri                                                                                                        | r home size.<br>ires no atter<br>e a year, dep<br>haps every 5                                                                                | ending                         |
| 2In 0.<br>SIZING 8<br>1. U5<br>sch<br>COSTS<br>1. Ira<br>\$26<br>2. Bui<br>3%<br>MODEL<br>NUMBER                         | 5" lin<br><b>GRO</b><br>recomme<br>cols,<br>de pri<br>.05 fo<br>lt-in<br>extra.<br>TECF                 | es at 2<br>WTH PC<br>ended 1<br>etc.<br>ces of<br>r 1" si<br>by-pass<br>sp-pass                             | US are<br>zes (†<br>featu                                          | reduced<br>IAL<br>identia<br>\$14.70<br>ome sia<br>re (for<br>ANCE-OL<br>ANCE-OL            | d pressure<br>al use; 223:<br>D for 0.5",<br>r thermal e:<br>rrthermal e: | fall-off,<br>S sized fo<br>\$16.65 fo<br>xpansion)<br>OPERATI                                                | i.e., 20<br>pr motels,<br>pr 0.75",<br>costs abo | Ib total<br>IN:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In | ERATION<br>• Once se<br>other ti<br>on wate                                                                                        | loss (due       ON REQUI       P, U135 ha       ation shou       & MAINTEE       t to desir       han cleanin       r quality)       PRES       . (All       cal     Regu               | to demand) or<br>REMENTS<br>ve union.<br>1d take 15-30<br>NANCE RECM<br>ed outlet pro-<br>ng strainer 1<br>and pressure<br>SURE RANGES<br>valves adju:<br>lates to stai                                                                               | n house side<br>0 minutes for<br>UIREMENTS<br>essure, requ<br>(perhaps once<br>e check (peri-<br>stable throu-<br>ndard range                                                                      | r home size.<br>ires no atter<br>e a year, dep<br>haps every 5<br>gh range.)                                                                  | years)                         |
| 2In 0.<br>SIZING 8<br>1. U5<br>sch<br>COSTS<br>1. Ira<br>\$26<br>2. Bui<br>33<br>MODEL<br>MUMBER<br>(MAJORI              | 5" lin<br>a GRO<br>recomm<br>ools,<br>de pri<br>.05 fo<br>lt-in<br>extra.<br>TECH<br>(R =<br>800g       | es at 2<br>WTH PC<br>ended 1<br>etc.<br>ces of<br>r 1" si<br>by-pass<br>fNICAL P<br>% REDUC                 | US are<br>zes (†<br>featu                                          | S14.70<br>MRE 512<br>ANCE-OL<br>ACTUA                                                       | d pressure<br>al use; 223:<br>D for 0.5",<br>r thermal e:<br>rrthermal e: | fall-off,<br>S sized fo<br>\$16.65 fo<br>xpansion)<br>OPERATI<br>RANGE<br>(TEMP. OTT<br>40° - 20             | i.e., 20<br>pr motels,<br>pr 0.75",<br>costs abo | Ib total<br>IN:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In | pressure<br>STALLATI<br>. US, USL<br>. Install<br>ERATION<br>Once se<br>other ti<br>on wate<br>STANDARD<br>CODES MET<br>iee Techni | loss (due       ON REQUI       P, UI35 ha       ation shou       & MAINTE       t to desir       han cleani       r quality)       PRES       (All       cal Regu       Fact       Regu | to demand) or<br>REMENTS<br>ve union.<br>1 take 15-30<br>NANCE REON<br>ed outlet pri-<br>and pressure<br>SURE RANGES<br>valves adju:<br>lates to stan<br>lates to ston                                                                                | n house side<br>o minutes for<br>UIREMENTS<br>essure, requ<br>(perhaps or<br>e check (peri-<br>stable throu-<br>ndard range<br>o PSI, recom-<br>er pressures                                       | r home size.<br>ires no atten<br>e a year, dep<br>haps every 5<br>gh range.)<br>(25-75 PS1).                                                  | ending<br>years)               |
| 2In 0.<br>SIZING 2<br>1. US<br>sch<br>COSTS<br>1. Ira<br>\$26<br>2. Bui<br>33<br>MODEL<br>NUMBER<br>(MAJOR)<br>US        | 5" lin<br>B GRO<br>recommools,<br>de pri<br>.05 fo<br>lt-in<br>extra.<br>TECP<br>(R =<br>BOD<br>B<br>NA | es at 2<br>WTH PC<br>ended 1<br>etc.<br>ces of<br>r 1" si<br>by-pass<br>NICAL P<br>* REDUC<br>SS<br>NA      | US are<br>zes (t<br>featu                                          | NA                                                                                          | d pressure<br>al use; 223:<br>D for 0.5",<br>r thermal e:<br>rrthermal e: | fall-off,<br>S sized fo<br>\$16.65 fo<br>xpansion)<br>OPERATI<br>RANGE<br>(TEM#, OTI<br>40° - 20<br>water to | i.e., 20<br>pr motels,<br>pr 0.75",<br>costs abo | Ib total<br>IN:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In | pressure<br>STALLATI<br>. US, USL<br>. Install<br>ERATION<br>Once se<br>other ti<br>on wate<br>STANDARD<br>CODES MET<br>iee Techni | loss (due<br>ON REQUI<br>P, UI35 has<br>at ion shou<br>& MAINTE<br>t to desirr<br>han cleanif<br>r quality)                                                                             | to demand) or<br>REMENTS<br>ve union.<br>1 take 15-30<br>NANCE REON<br>ed outlet pri-<br>and pressure<br>SURE RANGES<br>valves adju:<br>lates to stan<br>lates to ston                                                                                | n house side<br>0 minutes for<br>UIREMENTS<br>essure, requ<br>perhaps once<br>e check (perhaps<br>or check (perhaps<br>stable throu<br>ndard range<br>0 PSI, recom<br>er pressures<br>ashers, boos | r home size.<br>ires no atten<br>e a year, dep<br>haps every 5<br>gh range.)<br>(25-75 PSI).<br>mended pressu<br>(10-35 PSI).<br>ter heaters. | ending<br>years)               |
| 21n 0.<br>SIZING 2<br>1. US<br>SCh<br>COSTS<br>1. Tra<br>S26<br>2. But<br>33<br>MODEL<br>MUMBER<br>(MAJOR)<br>US<br>USLP | 5" lin<br>GRO<br>recomm<br>ools,<br>de pri<br>.05 fo<br>lt-in<br>extra.<br>TEC<br>(A =<br>NA            | es at 2<br>WTH PC<br>ended 1<br>etc.<br>ces of<br>r 1" si<br>by-pass<br>thicALP<br>* REDUC<br>SS<br>NA<br>" | US are<br>trent for res<br>US are<br>trent feature<br>REFORM<br>NA | reduced<br>IAL<br>identia<br>\$14.70<br>ome sia<br>re (for<br>ANCE-OL<br>ACTUA<br>COD<br>NA | d pressure<br>al use; 223:<br>D for 0.5",<br>r thermal e:<br>rrthermal e: | fall-off,<br>S sized fo<br>\$16.65 fo<br>xpansion)<br>OPERATI<br>RANGE<br>(TEAW, OTI<br>40° - 20<br>water to | i.e., 20<br>pr motels,<br>pr 0.75",<br>costs abo | Ib total<br>IN:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In:<br>In | pressure<br>STALLATI<br>. US, USL<br>. Install<br>ERATION<br>Once se<br>other ti<br>on wate<br>STANDARD<br>CODES MET<br>iee Techni | loss (due<br>ON REQUI<br>P, U135 ha<br>ation shou<br>& MAINTE<br>t to desir<br>han cleani<br>r quality)<br>PRES.<br>(All<br>cal Regu<br>Main<br>Regu                                    | to demand) of<br>REMENTS<br>ve union.<br>Id take 15-30<br>NANCE REOM<br>ed outlet pro-<br>d outlet pro-<br>d outlet pro-<br>d outlet pro-<br>sure RANGES<br>valves adjustication<br>Tates to star<br>ory set at 50<br>Tates to lowe<br>ly for dishwat | n house side<br>0 minutes for<br>UIREMENTS<br>essure, requ<br>perhaps once<br>e check (perhaps<br>or check (perhaps<br>stable throu<br>ndard range<br>0 PSI, recom<br>er pressures<br>ashers, boos | r home size.<br>ires no atten<br>e a year, dep<br>haps every 5<br>gh range.)<br>(25-75 PSI).<br>mended pressu<br>(10-35 PSI).<br>ter heaters. | ending<br>years)               |

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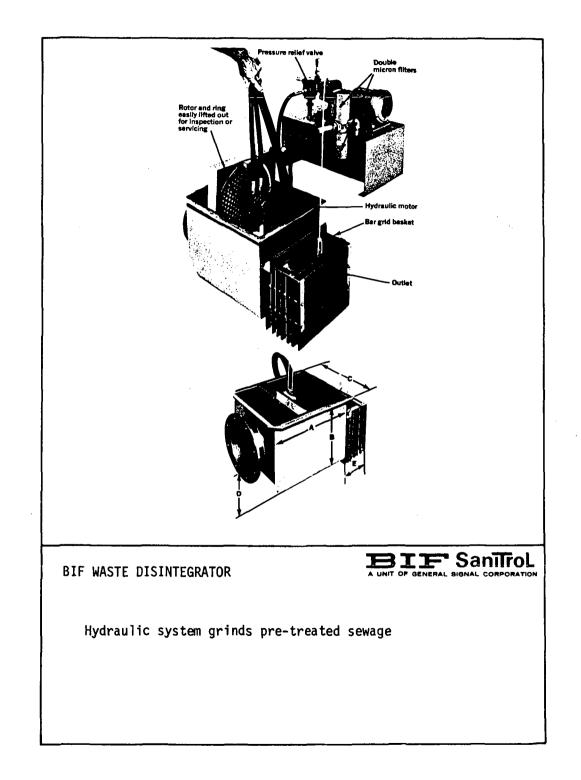
## Accessories

# Introduction

BIF Waste Disintegrator—Hydraulic Waste Disintegrator, 310 **BIF Sanitrol** BIF Lagoon Monitor-Lagoon Flow Monitoring System, 312 **BIF Sanitrol** Flygt ENH-10-Mercury Switch Liquid Level Sensor, 314 Flygt Corporation Level Sensor---Mercury Switch Liquid Level Sensor, 316 Franklin Research Coli-Count-Water Tester for Bacterial Contamination, 318 Millipore Corporation Neo Comminutors-Sewage Comminutors, 320 Nishihara Environmental Sanitation Research Corp., Ltd. Activator-Sewage Comminutors, 322 Pollution Control, Inc.

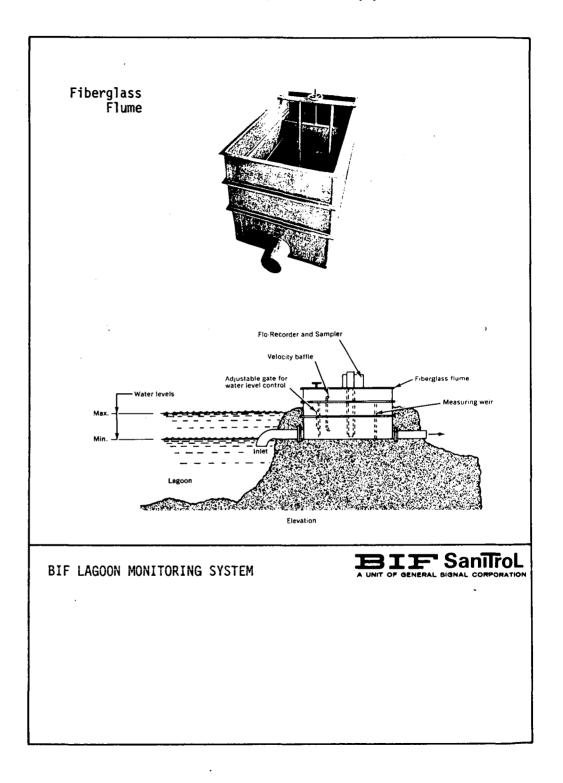
This section contains a miscellany of accessories for use in sewage treatment systems. Included are grinders (comminutors), level-sensing switches, a lagoon-flow monitoring device, and a self-contained portable test kit for performing microbiological analyses (for determining the adequacy of sewage disinfection procedures, for example).

**Accessories** 



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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | int, Sales                                                                                                    |                                                                                      |                                       |                                                                                                                                                                                   |                                                                                                                              | HYDRAU                                                                                                                  | JLIC WASTE                                                                |                                               | A        |
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---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------|----------|
| <ol> <li>FEATURES         <ol> <li>Stainless steel submerged disintegrator reduces solids to less than 1/4" in size, for wet well or pre-treatment applications.</li> <li>Electrically driven hydraulic motor weights only 22 lb. (110 or 220 V AC), has warning light, operates at up to 150 PSI oil pressure.</li> <li>Vertical to horizontal mounting in channel or flume box with bar grid discharge screening.</li> <li>Remote power pack with slip-fitting removable disintegrating assembly.</li> <li>Is-5 Micron filters used in motor.</li> <li>6 models for 100 to 1200 GPM capacities; hoses in 5' to 50' lengths.</li> </ol> </li> </ol> |                                                                                    |                                                                                                      |                                                                       |                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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                                         | less<br>ons.<br>10<br>oil<br>th<br>ng | and rin<br>2. Sewage<br>3. Power fi                                                                                                                                               | g.<br>is ground,                                                                                                             | flows throug<br>w or over-cap                                                                                           | nh bar grid                                                               | itacts grindin<br>for lower di<br>passes over | -<br>sch |
| MODEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ĭ I                                                                                | DIMENSIO                                                                                             | MENSIONS                                                              |                                                                                  | RATED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TANK                                                                                                          | COSTS (DC                                                                            |                                       | ARE                                                                                                                                                                               |                                                                                                                              | SIGN UTILITY REQUIREMENTS                                                                                               | 1                                                                         | Т                                             |          |
| MUNIER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | LENGTO                                                                             | WIDTH                                                                                                | нею                                                                   | HT (LE                                                                           | CARACITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                               | SUGG. LIST<br>(FOB<br>FACTORY)                                                       | INSTALL<br>COST                       | OPERATE<br>COST                                                                                                                                                                   | LIFETIME<br>(YRS.)                                                                                                           | ELECTRICITY<br>(RATING)                                                                                                 |                                                                           | OPERATING<br>SUPPLIES                         |          |
| 71                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 27"                                                                                | 14 <u>3</u> "                                                                                        | 16                                                                    |                                                                                  | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | NA                                                                                                            | 1550                                                                                 |                                       | 1 HP                                                                                                                                                                              |                                                                                                                              | 110 or<br>220 V AC                                                                                                      |                                                                           |                                               | Ι        |
| 91                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 27"                                                                                | 144                                                                                                  | 162                                                                   | <br>ī                                                                            | 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | •                                                                                                             | 1885                                                                                 |                                       | 11/2 HP                                                                                                                                                                           |                                                                                                                              | "                                                                                                                       |                                                                           | ļ                                             |          |
| 121                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 32"                                                                                | 174                                                                                                  | 17                                                                    |                                                                                  | 400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Ι.                                                                                                            | 2450                                                                                 |                                       | 2 HP                                                                                                                                                                              |                                                                                                                              |                                                                                                                         |                                                                           |                                               | ļ        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <u> </u>                                                                           | - <b>`</b>                                                                                           |                                                                       | <u> </u>                                                                         | 400                      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| 2. Mod<br>COSTS<br>1. Lis<br>flu<br>bas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | i largen<br>del 161-<br>it price<br>id flow<br>sket.                               | 21 <sup>3</sup><br><b>NTH PC</b><br>r capac<br>2 has<br>e inclu                                      | 22'<br>DTENT<br>ities<br>2 16"<br>des pu<br>ter; p                    | IAL<br>for hor<br>rotors<br>mp; oil                                              | 750                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 161 capac<br>motor; g<br>flume and                                                                            | les.<br>ities.<br>ages; fil<br>bar grid                                              | IN<br>ters                            | STALLATI<br>1. In-line<br>grindin<br>2. Angle si<br>3. Plumbing<br>similar<br>PERATION<br>1. Unit cal<br>2. Not close                                                             | installat<br>perfore t<br>ports re-<br>to commin<br>MAINTE<br>be hand<br>ged by me                                           | ion with flam<br>reatment.<br>quired for we                                                                             | t well inst<br>s needed fo<br><b>JREMENTS</b><br>spection or<br>plastics. | r installatio                                 |          |
| SIZING<br>1. 507<br>2. Moc<br>COSTS<br>1. Lis<br>flu<br>bas<br>2. Re;<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | a GROM<br>( large<br>lel 161-<br>id flow<br>(ket.<br>placement<br>TECF             | 21 <sup>3</sup><br>WTH PC<br>r capac<br>-2 has<br>e inclu<br>w adjus<br>nt roto                      | 22'<br>DTENT<br>ities<br>2 16"<br>des pl<br>ter; p<br>rs or           | IAL<br>for hor<br>rotors<br>mp; oil<br>lus ste<br>rings r                        | 750<br><sup>1</sup> Capaciti<br>rizontal mou<br>for double<br>1 reservoir:<br>rel flanged<br>-un \$100 - \$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | motor; g<br>flume and<br>i175 per s                                                                           | ical styl<br>les.<br>ities.<br>ages; fil<br>bar grid<br>et.                          | IN<br>ters:<br>Office                 | ng.<br>STALLATI<br>1. In-line<br>grindin.<br>2. Angle s:<br>3. Plumbing<br>FRATION<br>1. Unit cau<br>2. Not clos<br>3. Periodi                                                    | installat<br>g before t<br>upports reg<br>g and elec<br>to comin<br><b>G MAINTE</b><br>h be hand<br>gged by me<br>inspection | REMENTS<br>ion with flan<br>reatment.<br>quired for we<br>trician skill<br>NANCE REQU<br>lifted for in<br>tal, glass or | t well inst<br>s needed fo<br><b>JREMENTS</b><br>spection or<br>plastics. | allations.<br>r installatio                   |          |
| SIZING<br>1. 507<br>2. Mod<br>COSTS<br>1. L15<br>flubas<br>2. Ref<br>MODEL<br>MODEL<br>MANDI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | a GROM<br>( larger<br>lel 161-<br>id flow<br>ket.<br>Dlacement<br>(R=1<br>800s     | 21 <sup>3</sup> "<br>21 <sup>4</sup><br>WTH PC<br>r capac<br>-2 has<br>e inclu<br>a dijus<br>nt roto | 22'<br>DTENT<br>ities<br>2 16"<br>des pu<br>ter; p<br>rs or<br>ERFORM | IAL<br>for hor<br>rotors<br>mp; oil<br>lus ste<br>rings r<br>LANCE-OL<br>- ACTUA | 750<br><sup>1</sup> Capaciti<br><sup>1</sup> Capaciti                                                                                                                                                                           | Inting sty<br>161 capac<br>motor; g<br>flume and<br>1175 per s<br>OPERATII<br>RANGEE<br>(TEMP, OT-            | ical styl<br>les.<br>ities.<br>ages; fil<br>bar grid<br>et.<br>vo N<br>iemi o        | ters: OF                              | ng.<br>STALLATI<br>1. In-Tine<br>grindin<br>2. Angle s:<br>similar:<br>ERATION<br>1. Unit can<br>2. Not clos<br>3. Periodi<br>STANDARDA<br>CODES MET<br>U.S.Forest                | installat<br>g before t<br>ipports re-<br>g and elec<br>to coming<br>mAINTE<br>h be hand<br>ged by me<br>inspection<br>Svc   | REMENTS<br>ion with flan<br>reatment.<br>quired for we<br>trician skill<br>NANCE REQU<br>lifted for in<br>tal, glass or | t well inst<br>s needed fo<br><b>JREMENTS</b><br>spection or<br>plastics. | allations.<br>r installatio                   |          |
| SIZING<br>1. 507<br>2. Moc<br>COSTS<br>1. Lis<br>flu<br>bas<br>2. Re;<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | GROM<br>( larger<br>lel 161:<br>it price<br>id flow<br>ket.<br>placement<br>(R = 1 | 21 <sup>3</sup><br>WTH PC<br>r capac<br>-2 has<br>e inclu<br>adjus<br>nt roto                        | 22'<br>DTENT<br>ities<br>2 16"<br>des puter; p<br>rs or<br>ERFORM     | IAL<br>for hor<br>rotors<br>mp; oil<br>lus ste<br>rings r<br>HANCE-OL<br>- ACTUA | 750<br><sup>1</sup> Capacit<br><sup>1</sup> Capacit<br><sup></sup> | motor; g<br>flume and<br>i175 per s                                                                           | ical styl<br>les.<br>ities.<br>ages; fil<br>bar grid<br>et.<br>wo<br>nem; o<br>or Mi | OF<br>ters.<br>OF                     | ng.<br>STALLATI<br>1. In-line<br>grindin<br>2. Angle so<br>similar<br>FRATION<br>1. Unit cai<br>2. Not clos<br>3. Periodia<br>STANDARDA<br>CODES MET                              | installat<br>g before t<br>ipports re-<br>g and elec<br>to coming<br>mAINTE<br>h be hand<br>ged by me<br>inspection<br>Svc   | REMENTS<br>ion with flan<br>reatment.<br>quired for we<br>trician skill<br>NANCE REQU<br>lifted for in<br>tal, glass or | t well inst<br>s needed fo<br><b>JREMENTS</b><br>spection or<br>plastics. | allations.<br>r installatio                   |          |
| SIZING<br>1. 507<br>2. Mod<br>COSTS<br>1. L15<br>flubas<br>2. Ref<br>MODEL<br>MODEL<br>MANDI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | a GROM<br>( larger<br>lel 161-<br>id flow<br>ket.<br>Dlacement<br>(R=1<br>800s     | 21 <sup>3</sup> "<br>21 <sup>4</sup><br>WTH PC<br>r capac<br>-2 has<br>e inclu<br>a dijus<br>nt roto | 22'<br>DTENT<br>ities<br>2 16"<br>des pu<br>ter; p<br>rs or<br>ERFORM | IAL<br>for hor<br>rotors<br>mp; oil<br>lus ste<br>rings r<br>LANCE-OL<br>- ACTUA | 750<br><sup>1</sup> Capacit<br><sup>1</sup> Capacit<br><sup></sup> | Inting sty<br>161 capac<br>motor; g<br>flume and<br>175 per s<br>OPERATH<br>RAWGEE<br>(TEMP, OTH<br>Submerged | ical styl<br>les.<br>ities.<br>ages; fil<br>bar grid<br>et.<br>wo<br>nem; o<br>or Mi | OF<br>ters.<br>OF                     | ng.<br>STALLATI<br>1. In-1ine<br>grindin<br>2. Angle si<br>3. Plumbin<br>FRATION<br>1. Unit ca<br>2. Not cloy<br>3. Perfoil<br>STANDARDI<br>CODES MET<br>U.S. Forest<br>Specifies | installat<br>g before t<br>ipports re-<br>g and elec<br>to coming<br>mAINTE<br>h be hand<br>ged by me<br>inspection<br>Svc   | REMENTS<br>ion with flan<br>reatment.<br>quired for we<br>trician skill<br>NANCE REQU<br>lifted for in<br>tal, glass or | t well inst<br>s needed fo<br><b>JREMENTS</b><br>spection or<br>plastics. | allations.<br>r installatio                   |          |
| SIZING<br>1. 507<br>2. Mod<br>COSTS<br>1. L15<br>flubas<br>2. Ref<br>MODEL<br>MODEL<br>MANDI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | a GROM<br>( larger<br>lel 161-<br>id flow<br>ket.<br>Dlacement<br>(R=1<br>800s     | 21 <sup>3</sup> "<br>21 <sup>4</sup><br>WTH PC<br>r capac<br>-2 has<br>e inclu<br>a dijus<br>nt roto | 22'<br>DTENT<br>ities<br>2 16"<br>des pu<br>ter; p<br>rs or<br>ERFORM | IAL<br>for hor<br>rotors<br>mp; oil<br>lus ste<br>rings r<br>LANCE-OL<br>- ACTUA | 750<br><sup>1</sup> Capacit<br><sup>1</sup> Capacit<br><sup></sup> | Inting sty<br>161 capac<br>motor; g<br>flume and<br>175 per s<br>OPERATH<br>RAWGEE<br>(TEMP, OTH<br>Submerged | ical styl<br>les.<br>ities.<br>ages; fil<br>bar grid<br>et.<br>wo<br>nem; o<br>or Mi | OF<br>ters.<br>OF                     | ng.<br>STALLATI<br>1. In-1ine<br>grindin<br>2. Angle si<br>3. Plumbin<br>FRATION<br>1. Unit ca<br>2. Not cloy<br>3. Perfoil<br>STANDARDI<br>CODES MET<br>U.S. Forest<br>Specifies | installat<br>g before t<br>ipports re-<br>g and elec<br>to coming<br>mAINTE<br>h be hand<br>ged by me<br>inspection<br>Svc   | REMENTS<br>ion with flan<br>reatment.<br>quired for we<br>trician skill<br>NANCE REQU<br>lifted for in<br>tal, glass or | t well inst<br>s needed fo<br><b>JREMENTS</b><br>spection or<br>plastics. | allations.<br>r installatio                   |          |



Accessories

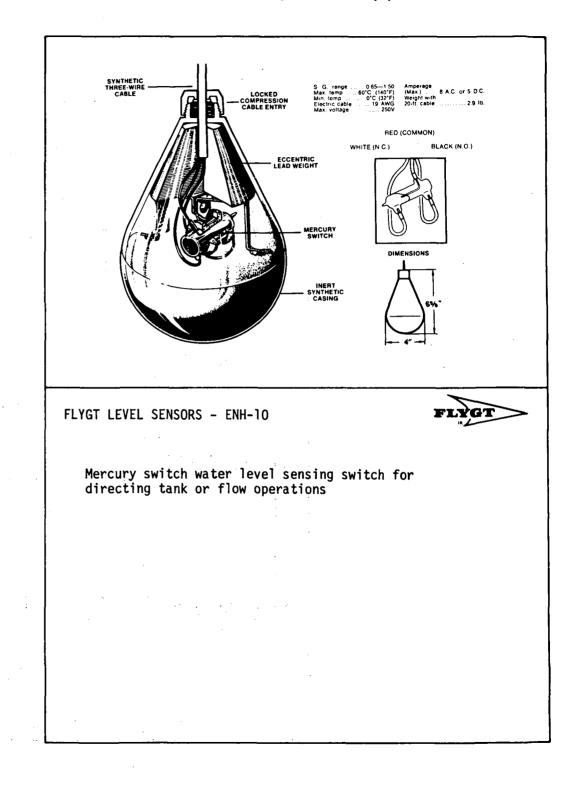
**BIF SANITROL BIF LAGOON MONITOR** P. O. BOX 41 LARGO, FLORIDA 33540 (813) 584-2157 Attn: Mr. Norman Smith, Vice-President, Sales LAGOON FLOW MONITORING SYSTEM **FEATURES** OPERATION Fiberglass flume (up to 1000 GPM) placed at lagoon discharge point; can be outfitted for lagoon level control, flow re-cording and sampling; optional disinfection equipment. 1. Lagoon discharge flows into flume, with base of flume at minimum lagoon level. Adjustable gate for water level controls discharge. coroing and sampling; optional disinfection equipment.
2. Measuring weir and adjusting gate meets most state health authority requirements for weed and pest control.
3. Can record volume on a daily, monthly and accumulated basis.
4. Provides 30 day strip chart for graphic indications of flow. Gravity Flo-Recorder measures flow.
 Flo-Ratio Sampler lifts samples either on flow and/or time basis with came on a program rotor (8 to 1 range). 5. Refrigeration unit can stabilize biological contents for sampling. COSTS (DOLLARS) UTILITY REQUIREMENTS MODEL BATED TANK ΕĒ (GPM) GAL. 3G. LIST ELECTRICITY (LB.) INSTALL OPERATE WIDTH MAJOR ENGTH HEIGH FOR (YRL) COST CORT (BATING) 60-111 Flume Fiher Un to 110 ¥ AC<sup>1</sup> 6' 3'6" 3' 6" NA 1072 Varies 1000 a lass <sup>1</sup>Or DC operation with recorder. INSTALLATION REQUIREMENTS SIZING & GROWTH POTENTIAL Installation of flume requires excavation and pipe connection at discharge point in lagoon shore.
 Electrical and plumbing skills required for installation of components; flume involves simple installation. Flumes available in sizes starting at 12" x 48" x 16" Ø 100 GPM to 1000 GPM; made to customer specifications.
 Parallel installations available for larger or multi-discharge applications. COSTS **OPERATION & MAINTENANCE REQUIREMENTS**  List price includes fiberglass flume only; control gate for lagoon level control, flow recorder and sampler are optional Periodic inspection and controlling at equipment; extended automatic unattended operation possible. additions STIOOOB Flow Recorder: \$1055 with 4 ft. extension and 30 day strip chart and totalizer; ST41-2 Sampler (5 ft.), \$705. TECHNICAL PERFORMANCE-OUTPUT MODEL STANDARDS OPERATING NOISE RANGES (TEMP, OTHER) 6 000M CODES MET INALION: 8 00 000 800<sub>8</sub> WARRANTIES, GUARANTEES, & SERVICE TECHNICAL PERFORMANCE Warranty on parts and workmanship.
 Distribution through locally licensed dealers of sewage treatment and control equipment. ACCURATE AS OF July 31, 1972 COMMENTS 1. More information available from manufacturer on samplers, recorders, sensitizers, refrigeration sampling, etc.

None

NOTE: The above data are based on information supplied by the manufacturer. Demonstration Water Project cannot assume responsibility for their accuracy. Please contact manufacturer for latest specifications and prices.

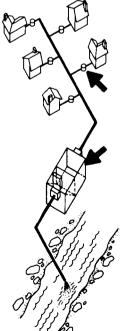


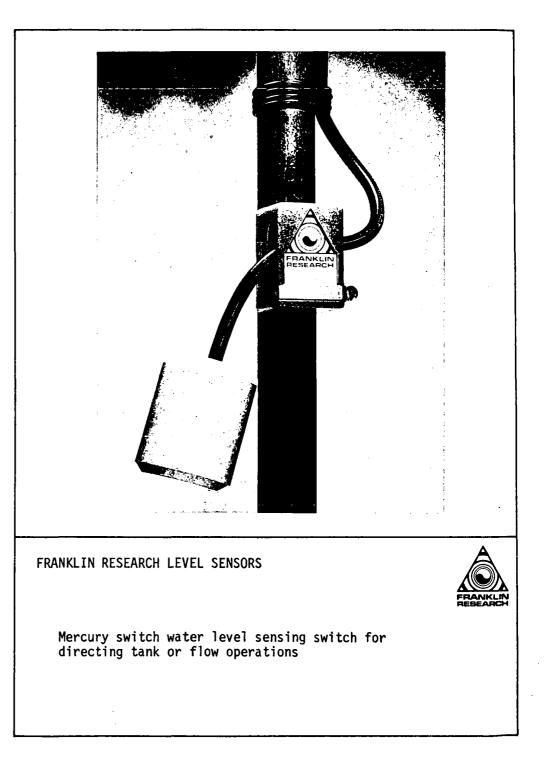
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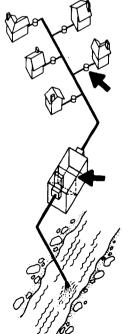
Accessories

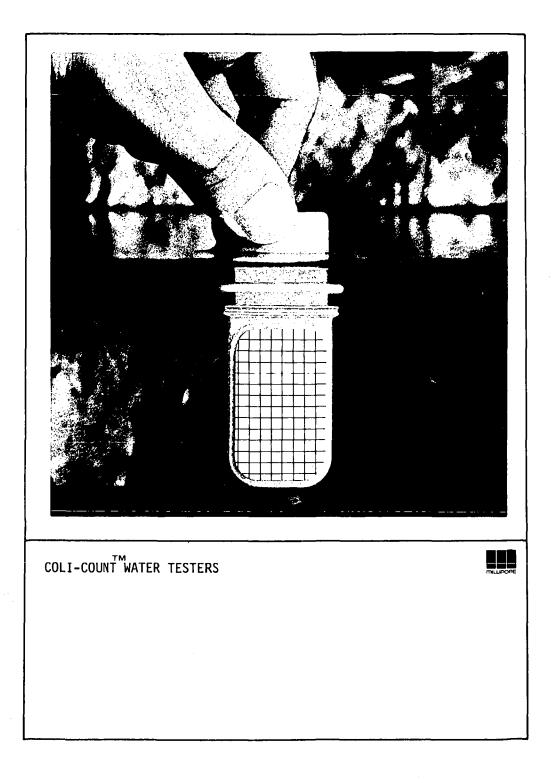
| FEATUR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                              |                                                    |                           | cholls, Man                                                         |                            |                                  | _                              | OPERATION LEVEL SENSOR                                                                                                                                                                            |                                                                  |                                                                                        |                                                                  |             |                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------|---------------------------|---------------------------------------------------------------------|----------------------------|----------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------|-------------------|
| <ul> <li>Protones</li> <li>Polypropylene cased, mercury switch liquid level sensor.</li> <li>Nodels for use in liquids from 0.65 to 1.50 specific gravity<br/>(standard: 0.95 - 1.10 SG).</li> <li>Used to activate circuits operating motors, pumps &amp; valves.</li> <li>Especially used in tanks or pits for turning on and off purps<br/>at pre-set liquid levels for pumping out of wastes (as in a<br/>lift station).</li> <li>Sensor hangs in liquid by synthetic cable.</li> </ul> |                                              |                                                    |                           |                                                                     |                            |                                  | ty<br>s.<br>Tos                | OPERATION<br>1. Mercury switch operates "on-off" circuit when float body of<br>sensor is moved to floating position by rising liquid or move<br>to initial hanging position by descending liquid. |                                                                  |                                                                                        |                                                                  |             |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | DIMENSIONS                                   |                                                    |                           |                                                                     | T                          |                                  |                                | A980                                                                                                                                                                                              |                                                                  | UTILITY REQUIREMENTS                                                                   |                                                                  | <u></u>     |                   |
| MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | LENGT                                        | -                                                  | M HE                      | WEIGHT<br>GHT (LB.)                                                 | RATED<br>CAPACITY<br>(GPD) | TANK<br>CAPACITY<br>IGALJ        | SUGG, LIST<br>(FOB<br>FACTORY) | INSTALL                                                                                                                                                                                           |                                                                  | DESIGN<br>LIFETIME<br>(YRS.)                                                           | ELECTRICITY<br>(RATING)                                          |             | OPERATI<br>SUPPLI |
| Standaro                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 4"                                           | round                                              | 6                         | 5" 2.9 <sup>1</sup>                                                 | NA                         | NA                               | 45-60                          |                                                                                                                                                                                                   | None                                                             | life of<br>tank                                                                        | 110-250 ¥<br>8 amp (max)                                         |             | None              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                              |                                                    |                           |                                                                     |                            |                                  |                                |                                                                                                                                                                                                   |                                                                  |                                                                                        |                                                                  |             |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                              |                                                    |                           |                                                                     |                            |                                  |                                |                                                                                                                                                                                                   |                                                                  |                                                                                        |                                                                  |             |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                              |                                                    |                           |                                                                     |                            |                                  |                                |                                                                                                                                                                                                   |                                                                  |                                                                                        |                                                                  |             |                   |
| dif<br>COSTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | tiple :<br>ferent                            | sensor:<br>contro                                  | s can<br>bl pro           | TIAL<br>be hung at<br>cesses.<br>oot cable.                         | differen                   | t heights                        | for                            | 1<br>2<br><b>OP</b> 1                                                                                                                                                                             | . Sensors<br>level by<br>. Electric<br>ERATION<br>. No maini     | r cable.<br>:ian should<br><b>&amp; MAINTE</b>                                         | from top of co<br>i connect to t<br>NANCE REQU<br>evel of sensor | transformer | and contr         |
| 1. Hul<br>dif                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | tiple:<br>ferent                             | sensor:<br>contro                                  | s can<br>bl pro<br>o 60 f | be hung at<br>cesses.<br>oot cable.                                 |                            | t heights                        | for                            | 1<br>2<br><b>OP</b> 1                                                                                                                                                                             | . Sensors<br>level by<br>. Electric<br>ERATION<br>. No maini     | are hung f<br>cable.<br>fan should<br><b>&amp; MAINTE</b><br>tenance; 10               | from top of co<br>i connect to t<br>NANCE REQU<br>evel of sensor | transformer | and contr         |
| 1. Hul<br>dif                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | tiple :<br>ferent<br>es with                 | sensor:<br>contro<br>h 20 to                       | s can<br>p1 pro<br>o 60 f | be hung at<br>cesses.                                               | UT                         | OPERATII<br>RANGEI<br>(TEMP, OTF |                                | 1<br>2<br><b>OP</b> 1                                                                                                                                                                             | . Sensors<br>level by<br>. Electric<br>ERATION<br>. No maini     | are hung f<br>cable.<br>fan should<br><b>&amp; MAINTE</b><br>enance; 16<br>in flows of | from top of co<br>i connect to t<br>NANCE REQU<br>evel of sensor | transformer | and contr         |
| 1. Hul<br>dif<br>COSTS<br>1. Com<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                         | tiple :<br>ferent<br>es with<br>TECH<br>(R + | sensors<br>contro<br>h 20 to<br>MICAL F<br>S REDUC | o 60 f                    | be hung at<br>cesses.<br>oot cable.<br>MANCE-DUTPI<br>A - ACTUAL V. | UT                         | OPERATI                          |                                |                                                                                                                                                                                                   | Sensors<br>level by<br>Electric<br>ERATION<br>No maini<br>change | are hung f<br>cable.<br>fan should<br><b>&amp; MAINTE</b><br>enance; 16<br>in flows of | from top of co<br>i connect to t<br>NANCE REQU<br>evel of sensor | transformer | and contr         |
| 1. Hul<br>dif<br>COSTS<br>1. Com<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                         | tiple :<br>ferent<br>es with<br>TECH<br>(R + | sensors<br>contro<br>h 20 to<br>MICAL F<br>S REDUC | o 60 f                    | be hung at<br>cesses.<br>oot cable.<br>MANCE-DUTPI<br>A - ACTUAL V. | UT                         | OPERATI                          |                                |                                                                                                                                                                                                   | Sensors<br>level by<br>Electric<br>ERATION<br>No maini<br>change | are hung f<br>cable.<br>fan should<br><b>&amp; MAINTE</b><br>enance; 16<br>in flows of | from top of co<br>i connect to t<br>NANCE REQU<br>evel of sensor | transformer | and conti         |
| 1. Hul<br>dif<br>COSTS<br>1. Com<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                         | tiple :<br>ferent<br>es with<br>TECH<br>(R + | sensors<br>contro<br>h 20 to<br>MICAL F<br>S REDUC | o 60 f                    | be hung at<br>cesses.<br>oot cable.<br>MANCE-DUTPI<br>A - ACTUAL V. | UT                         | OPERATI                          |                                |                                                                                                                                                                                                   | Sensors<br>level by<br>Electric<br>ERATION<br>No maini<br>change | are hung f<br>cable.<br>fan should<br><b>&amp; MAINTE</b><br>enance; 16<br>in flows of | from top of co<br>i connect to t<br>NANCE REQU<br>evel of sensor | transformer | and cont          |



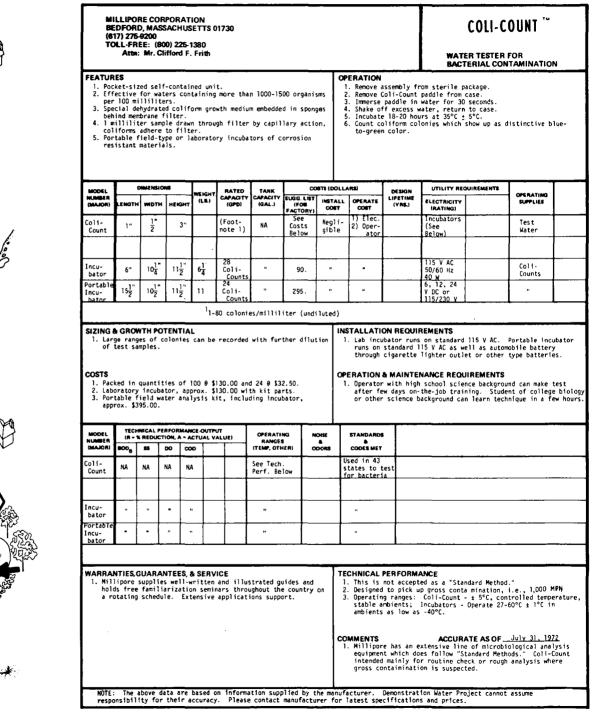


| FEATURES 1. Mercury level sensor switch cast in urethane float body. 2. Stainless steel and neoprene components.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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                     | OPERATION<br>1. Mercury switch is set for "on-off" at specified positions<br>relative to level of water.              |                                                                                            |                                                                                            |                                                   |                                                |
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---------------------|---------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------------------------|
| <ol> <li>Attaches with screw-clamp to any pipe or upright.</li> <li>For use in septic tanks, lift stations, or treatment tanks<br/>for turning on and off motor (pump, blower, or alarm system).</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |                                                      | 2. Float t                                        | ody rides                | on surface o                                                                                                          | f water to                                                                                 | pinpoint le                                                                                |                                                   |                                                |
| DIMENSIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <del> </del>                      |                                                      | ATE (DOLL                                         |                          |                                                                                                                       | UTILITY REQUIREMENTS                                                                       |                                                                                            | <u> </u>                                          |                                                |
| MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | LENGTH                                                                                                    | WIDTH                                                                                               | T                                      | WEIGH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   | TANK<br>CAPACITY<br>(GAL)                            | SUGG, LIST<br>(FOB<br>FACTORY)                    |                          |                                                                                                                       | DESIGN<br>LIFETIME<br>(YRL)                                                                | ELECTRICITY<br>(RATING)                                                                    |                                                   | OPERATIN<br>SUPPLIES                           |
| LS-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | NA                                | NA                                                   | \$19.                                             | See<br>Install.<br>Below | None                                                                                                                  | Life of<br>tank                                                                            | 0 - 230 V<br>AC or DC<br>1 amp                                                             |                                                   | None                                           |
| LS-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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                | \$23.                                             | u                        |                                                                                                                       |                                                                                            | 0 - 230 V<br>AC or DC<br>5 amp                                                             |                                                   | n                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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                | Ļ_                                                |                          |                                                                                                                       |                                                                                            |                                                                                            |                                                   |                                                |
| 1. Hu<br>fo<br>COSTS<br>1. Co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ltiple<br>r diffe                                                                                         | sensors<br>rent co<br>h 5 fee                                                                       | s can b<br>Introl                      | e place<br>processi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | d on same i<br>es.<br>avy-dúty ni |                                                      | ent uprigi                                        | ots<br>Of                | STALLATI<br>1. Can be<br>or deai<br>2. Electri<br>PERATION<br>1. No main                                              | ON REQUI<br>Installed<br>ler. Only<br>ician shoul<br>& MAINTE<br>atensace; h               | on any pipe-<br>tool needed<br>d connect to<br>NANCE REQU                                  | is screwin<br>control t<br>JIREMENT<br>l of sense | fver.<br>10x.<br>F <b>S</b><br>10r can be adji |
| fo<br><b>COSTS</b><br>1. Co<br>Ca                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | es.<br>avy-dúty ni                | eoprene ca                                           | ent uprigi<br>uble; exti                          | its IN<br>OF             | STALLATI<br>1. Can be<br>or deal<br>2. Electri<br>PERATION<br>1. No main<br>change                                    | ON REQUI<br>Installed<br>er. Only<br>clan shoul<br>& MAINTE<br>tenance; h<br>in flows o    | on any pipe-<br>tool needed<br>d connect to<br>NANCE REON<br>owever, leve                  | is screwin<br>control t<br>JIREMENT<br>l of sense | fver.<br>10x.<br>F <b>S</b><br>10r can be adji |
| 1. Hu<br>fo<br><b>COSTS</b><br>1. Co                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | es.<br>avy-dúty ni<br><b>PUT</b>  |                                                      | ent uprigi<br>uble; extr                          | its IN<br>OF             | STALLATI<br>1. Can be<br>or deai<br>2. Electri<br>PERATION<br>1. No main                                              | ON REQUI<br>installed<br>fer. Only<br>iclan shoul<br>& MAINTE<br>itenance; h<br>in flows c | on any pipe-<br>tool needed<br>d connect to<br>NANCE REON<br>owever, leve                  | is screwin<br>control t<br>JIREMENT<br>l of sense | fver.<br>lox.<br>F <b>S</b><br>or can be adju  |
| 1. Mu<br>fo<br>COSTS<br>1. Co<br>ca<br>MODEL<br>NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | es.<br>avy-dúty ni<br><b>PUT</b>  | COPTENE CE                                           | ng Ng No<br>Ng No<br>Ng No                        | its IN<br>a OF           | STALLATI<br>1. Can be<br>or deal<br>2. Electri<br>PERATION<br>1. No main<br>change                                    | ON REQUI<br>installed<br>fer. Only<br>iclan shoul<br>& MAINTE<br>itenance; h<br>in flows c | on any pipe-<br>tool needed<br>d connect to<br>NANCE REON<br>owever, leve                  | is screwin<br>control t<br>JIREMENT<br>l of sense | fver.<br>lox.<br>F <b>S</b><br>or can be adju  |
| 1. Hu<br>fo<br>COSTS<br>1. Co<br>Ca<br>MODEL<br>NUMBER<br>(MAJOR)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | es.<br>avy-dúty ni<br><b>PUT</b>  | OPERATI<br>RANGES<br>(TEMP, OT)<br>-30°F to          | ng Ng No<br>Ng No<br>Ng No                        | a OF                     | STALLATI<br>1. Can be<br>or deal<br>2. Electri<br>PERATION<br>1. No main<br>change                                    | ON REQUI<br>installed<br>fer. Only<br>iclan shoul<br>& MAINTE<br>itenance; h<br>in flows c | on any pipe-<br>tool needed<br>d connect to<br>NANCE REON<br>owever, leve                  | is screwin<br>control t<br>JIREMENT<br>l of sense | fver.<br>10x.<br>F <b>S</b><br>10r can be adji |
| 1. Hu<br>fo<br>COSTS<br>1. Co<br>Ca<br>MODEL<br>NUMBER<br>(MAJOR)<br>LS-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | es.<br>avy-dúty ni<br><b>PUT</b>  | OPERATII<br>RANGES<br>TREMP, OT<br>-30°F to<br>150°F | ent uprigi<br>sble; exti<br>sem C<br>o no<br>o do | a OF                     | STALLATI<br>1. Can be<br>or deal<br>2. Electri<br>PERATION<br>1. No main<br>change                                    | ON REQUI<br>installed<br>fer. Only<br>iclan shoul<br>& MAINTE<br>itenance; h<br>in flows c | on any pipe-<br>tool needed<br>d connect to<br>NANCE REON<br>owever, leve                  | is screwin<br>control t<br>JIREMENT<br>l of sense | nox.<br><b>FS</b><br>or can be adju            |
| 1. Hu<br>fo<br>COSTS<br>1. Co<br>Ca<br>MODEL<br>NUMBER<br>(MAJOR)<br>LS-1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | es.<br>avy-dúty ni<br><b>PUT</b>  | OPERATII<br>RANGES<br>TREMP, OT<br>-30°F to<br>150°F | ent uprigi<br>sble; exti<br>sem C<br>o no<br>o do | a OF                     | STALLATI<br>1. Can be<br>or deal<br>2. Electri<br>PERATION<br>1. No main<br>change                                    | ON REQUI<br>installed<br>fer. Only<br>iclan shoul<br>& MAINTE<br>itenance; h<br>in flows c | on any pipe-<br>tool needed<br>d connect to<br>NANCE REON<br>owever, leve                  | is screwin<br>control t<br>JIREMENT<br>l of sense | fver.<br>lox.<br>F <b>S</b><br>or can be adju  |
| 1. Nu fo<br>COSTS<br>1. Co<br>COSTS<br>1. CO<br>1. CO | tiple<br>r diffe<br>nes wit<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to<br>to | sensors<br>rent cc<br>h 5 fee<br>/foot.<br>NICAL P/<br>s REDUC<br>85<br>NA<br>U<br>SUARA<br>d by ma | ERFORMA<br>EL OF I<br>NA<br>NTEESS     | IB/2 here out the second secon | es.<br>avy-duty ni<br>Vatuei      | OPERATU<br>RANGE<br>TREM, OT<br>-30°F to<br>150°F    | ent uprigi                                        | a OF                     | STALLAT<br>1. Can be<br>or deal<br>2. Electri<br>PERATION<br>1. No main<br>change<br>STANDARD<br>STANDARD<br>STANDARD | ON REQUI<br>installed<br>fer. Only<br>iclan shoul<br>& MAINTE<br>itenance; h<br>in flows c | on any pipe-<br>tooi needed<br>d connect to<br>NANCE REON<br>Ovever. Teve<br>r processes t | is screwin<br>control t<br>JIREMENT<br>l of sense | fver.<br>lox.<br><b>FS</b><br>or can be adj    |

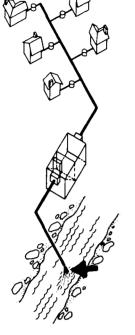


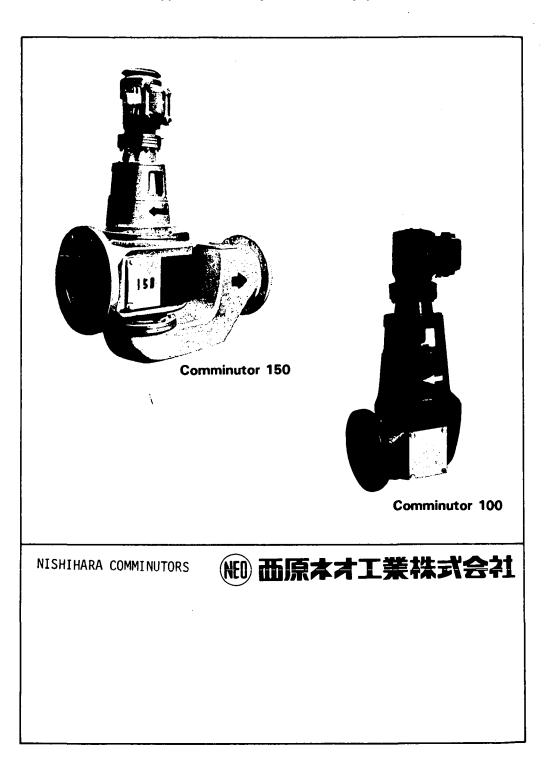


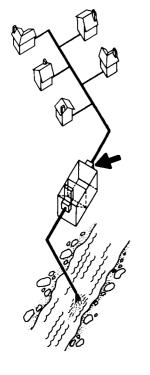
Accessories



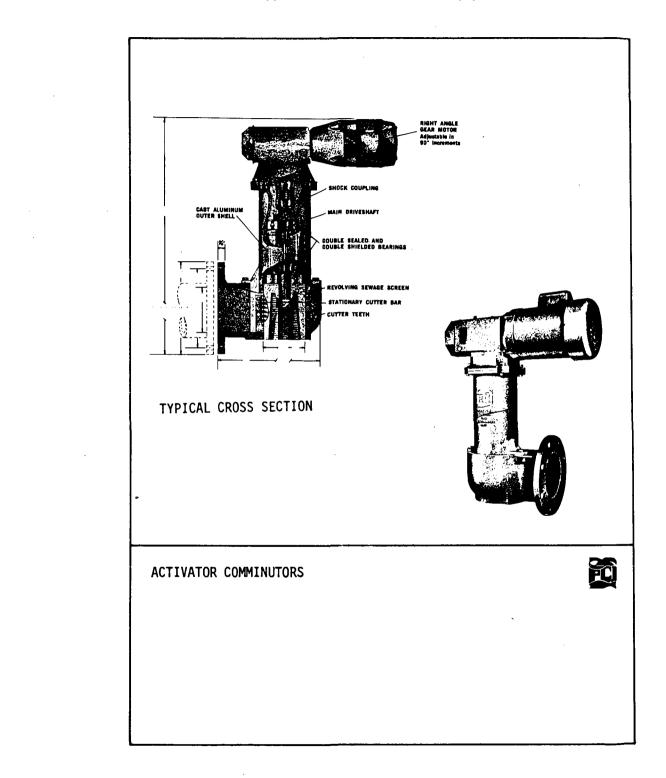








| 1. Moi<br>flc<br>2. SM-<br>3. Sir<br>sta<br>4. Opt<br>cut                                               | ATURES<br>1. Motor driven stainless steel comminuting device for in-line<br>flow through disintegration and reduction of waste particle:<br>2. SM-Cyclo gear motor, continuous operation.<br>3. Sintered tungsten carbide tip of stud cutter, steel line and<br>stationary cutters.<br>4. Optional reversing device allows removal of unbreakables fro<br>cutters.<br>5. 125 lb. standard flanges. |                                                                                              |                                                                                           |                                                                                         |                                                                 |                                                                                                                |                                                                                  | e l<br>es. a<br>nd 3                                                                                    | 2. Revolvi<br>sewage<br>3. Dischar                                                                                  | enters com<br>ng and sta<br>through.<br>ge takes p                                                                      | minutor throu<br>tionary cutte<br>lace out bott<br>tlet pipe for                                                                                                                                                                   | ers reduce second of device                                                                                  | e or continue                                                    | es în-                      |
|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------|
|                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                    | MENSIO                                                                                       | <b>HE</b> 1                                                                               | 1                                                                                       |                                                                 |                                                                                                                | TANK COITS (                                                                     |                                                                                                         |                                                                                                                     |                                                                                                                         |                                                                                                                                                                                                                                    |                                                                                                              | i                                                                | DRUM                        |
| MODEL<br>NUMBER<br>(MAJOR)                                                                              | LENGTH                                                                                                                                                                                                                                                                                                                                                                                             | WIDTH                                                                                        | HENOHT                                                                                    | THEIGHT                                                                                 | RATED<br>CAPACITY<br>(GPD)                                      |                                                                                                                | SUGG. LIST<br>(FOB<br>FACTORY)                                                   | INSTALL<br>COST                                                                                         | OPERATE                                                                                                             | DESIGN<br>LIFETIME<br>(YRS.)                                                                                            | ELECTRICITY<br>(RATING)                                                                                                                                                                                                            | MOTOR                                                                                                        | OPERATING<br>SUPPLIES                                            | SPEED<br>(RPM)              |
| 100                                                                                                     | 14 <u>3</u> "                                                                                                                                                                                                                                                                                                                                                                                      | 11 <u>23</u> "<br>32                                                                         | 30 <u>3</u> "                                                                             | 185                                                                                     | Average<br>Max:<br>53.000                                       | NA                                                                                                             |                                                                                  |                                                                                                         |                                                                                                                     |                                                                                                                         | 230/460 V<br>AC; 3 ph;<br>L48 TENV                                                                                                                                                                                                 | 1/4                                                                                                          | Grease                                                           | 50 0<br>60 Hz               |
| 150                                                                                                     | 17 <u>9</u> "                                                                                                                                                                                                                                                                                                                                                                                      | 17"                                                                                          | 31 3"                                                                                     | 254                                                                                     | Average<br>Max:<br>0.21 M                                       | "                                                                                                              |                                                                                  |                                                                                                         |                                                                                                                     |                                                                                                                         |                                                                                                                                                                                                                                    | 1/4                                                                                                          | а <sup>с</sup>                                                   | 40.7<br>60 Hz               |
| 250                                                                                                     | 26 <u>5</u> "                                                                                                                                                                                                                                                                                                                                                                                      | 23 <u>11</u> "<br>23 <u>32</u> "                                                             | 43 <del>3</del> "                                                                         | 573                                                                                     | Average<br>Max:<br>0.79 M                                       |                                                                                                                |                                                                                  |                                                                                                         |                                                                                                                     |                                                                                                                         | 230/460 V<br>AC; 3 ph;<br>M56 TENV                                                                                                                                                                                                 | 1/2                                                                                                          | •                                                                | 50 @<br>60 Hz               |
| 350                                                                                                     | 20 <u>3</u> 2"                                                                                                                                                                                                                                                                                                                                                                                     | 20 <u>3</u> *                                                                                | 45 <u>17</u> "                                                                            | 662                                                                                     | Average<br>Max:<br>1.8 M                                        | •                                                                                                              |                                                                                  |                                                                                                         |                                                                                                                     |                                                                                                                         | 230/460 V<br>AC; 3 ph;<br>143 T TEFC                                                                                                                                                                                               | 1                                                                                                            | •                                                                | ·                           |
| 1. 180<br>sha<br>ibl<br>2. Ave<br>gre<br><b>COSTS</b><br>1. Ext                                         | P retur<br>ft exte<br>e place<br>rage ma<br>ater ca<br>ended d                                                                                                                                                                                                                                                                                                                                     | n elbow<br>nsions<br>ments.<br>ximum f<br>pacitie<br>rive sh                                 | is (cont<br>from mo<br>lows gi<br>s.<br>afts ar                                           | inued i<br>otor to<br>ven; at<br>id retur                                               | comminuto<br>solute ma                                          | low) availa<br>or availabl<br>aximums up<br>are optior<br>out.                                                 | le for fle<br>to 100%                                                            | e 1<br>2x-<br>3<br>0P                                                                                   | . Model 11<br>7-7/8"<br>(return<br>Plumbin<br>Models<br>ERATION<br>. Periodic<br>. Grease                           | 00 has 5-3<br>inlet with<br>elbows, s<br>g and elec<br>350 and 50<br>& MAINTE<br>maintena<br>ports allo<br>replacemen   | REMENTS<br>/16" inlet wi<br>13-1/2" flan<br>ame dimension<br>trical skills<br>D have concre<br>NANCE REOL<br>nce necessary<br>w extended un<br>t simple; any                                                                       | ige; 250, 10<br>is).<br>required fo<br>te inlet and<br><b>JIREMENTS</b><br>(not daily)<br>attended ope       | " inlet, 16"<br>or installati<br>d flow-throug<br>).<br>eration. | flange<br>ion.<br>Jh trougl |
| sha<br>ibl<br>2. Ave<br>gre<br><b>COSTS</b><br>1. Ext<br>2. Ele                                         | P retur<br>ft exte<br>e place<br>rage ma<br>ater ca<br>ended d<br>ctrical                                                                                                                                                                                                                                                                                                                          | n elbow<br>ments.<br>ximum f<br>pacitie<br>rive sh<br>costs                                  | is (cont<br>from mo<br>lows gi<br>is.<br>afts ar<br>proport                               | inued i<br>tor to<br>ven; at<br>d retur<br>ional t                                      | comminuto<br>solute ma<br>n elbows<br>so HP outp<br>um          | or availabl<br>aximums up<br>are optior<br>ut.                                                                 | le for fle<br>to 100%<br>nal extras                                              | (e) 1<br>(x-) 2<br>(OP) 1<br>(.) 1<br>2<br>3<br>3<br>3                                                  | . Model 11<br>7-7/8"<br>(return<br>Plumbin<br>ERATION<br>Periodic<br>Grease<br>Cutter<br>replace                    | DO has 5-3<br>inlet with<br>elbows, s<br>g and elec<br>350 and 50<br>& MAINTE<br>c maintena<br>ports allo<br>replacemen | /16" inlet wi<br>13-1/2" flan<br>ame dimension<br>trical skills<br>D have concre<br>NANCE REQU<br>nce necessary<br>w extended un                                                                                                   | ige; 250, 10<br>is).<br>required fo<br>te inlet and<br><b>JIREMENTS</b><br>(not daily)<br>attended ope       | " inlet, 16"<br>or installati<br>d flow-throug<br>).<br>eration. | flange<br>ion.<br>Jh trougi |
| 1. 180<br>sha<br>ib1<br>2. Ave<br>gre<br><b>COSTS</b><br>1. Ext                                         | P retur<br>ft exte<br>e place<br>rage ma<br>ater ca<br>ended d<br>ctrical                                                                                                                                                                                                                                                                                                                          | n elbow<br>nsions<br>ments.<br>ximum f<br>pacitie<br>rive sh<br>costs<br>NHCAL PER           | is (cont<br>from mo<br>lows gi<br>is.<br>afts ar<br>proport                               | inued i<br>tor to<br>ven; at<br>d retur<br>ional t<br>cce-ourp<br>cctuAL v              | comminuto<br>solute ma<br>n elbows<br>so HP outp<br>um          | or availabl<br>Eximums up<br>are optior                                                                        | le for fle<br>to 100%<br>mal extras                                              | e 1<br>2x-<br>3<br>0P                                                                                   | Model 11<br>7-7/8"<br>(return<br>Plumbin<br>Models<br>ERATION<br>Periodic<br>Grease<br>Cutter                       | 00 has 5-3<br>inlet with<br>elbows, s<br>g and elec<br>350 and 50<br>& MAINTE<br>c maintena<br>ports allo<br>replacemen | /16" inlet wi<br>13-1/2" flan<br>ame dimension<br>trical skills<br>D have concre<br>NANCE REQU<br>nce necessary<br>w extended un                                                                                                   | ge; 250, 10'<br>required fo<br>te inlet and<br><b>JIREMENTS</b><br>(not daily<br>attended ope<br>sewage plar | " inlet, 16"<br>or installati<br>d flow-throug<br>).<br>eration. | flange<br>ion.<br>Jh trougl |
| 1. 180<br>sha<br>ibi<br>2. Ave<br>gre<br>COSTS<br>1. Ext<br>2. Ele                                      | P retur<br>ft exte<br>e place<br>rage ma<br>ater ca<br>ended d<br>ctrical<br>TECH<br>(R = 5)                                                                                                                                                                                                                                                                                                       | n elbow<br>nsions<br>ments.<br>ximum f<br>pacitie<br>rive sh<br>costs<br>NHCAL PEE<br>REDUCT | is (cont<br>from mo<br>lows gi<br>is-<br>afts ar<br>proport<br>RFORMALION, A - /<br>DO CI | inued i<br>tor to<br>ven; at<br>d retur<br>ional t<br>cce-ourp<br>cctuAL v              | comminuto<br>osolute ma<br>n elbows<br>o HP outp<br>ut<br>ALUE) | or availabl<br>aximums up<br>are optior<br>out.<br>OPERATIN<br>RANGES<br>(TEMP, OTH<br>All weathe<br>indoor or | to 100%<br>to 100%<br>mal extras<br>mal extras<br>mal extras<br>mal extras       | ve 1<br>2x-<br>2<br>3<br>00P<br>1<br>1<br>3<br>3<br>3<br>3<br>5<br>5<br>5<br>8<br>5<br>5<br>7<br>8<br>5 | . Model 11<br>7-7/8"<br>(return<br>. Plumbin.<br>Models<br>ERATION<br>. Periodic<br>. Grease<br>. Cutter<br>replace | 00 has 5-3<br>inlet with<br>elbows, s<br>g and elec<br>350 and 50<br>& MAINTE<br>c maintena<br>ports allo<br>replacemen | <pre>/16" inlet wi<br/>13-1/2" flan<br/>ame dimension<br/>trical skills<br/>D have concre<br/>NANCE REQL<br/>nce necessary<br/>w extended un<br/>t simple; any</pre>                                                               | ge; 250, 10'<br>required fo<br>te inlet and<br><b>JIREMENTS</b><br>(not daily<br>attended ope<br>sewage plar | " inlet, 16"<br>or installati<br>d flow-throug<br>).<br>eration. | flange<br>ion.<br>Jh trougl |
| 1. 180<br>sha<br>ibl<br>2. Ave<br>gre<br>COSTS<br>1. Ext<br>2. Ele                                      | P retur<br>ft exte<br>e place<br>rage ma<br>ater ca<br>ended d<br>ctrical                                                                                                                                                                                                                                                                                                                          | n elbow<br>nsions<br>ments.<br>ximum f<br>pacitie<br>rive sh<br>costs<br>NHCAL PEE<br>REDUCT | is (cont<br>from mo<br>lows gi<br>is-<br>afts ar<br>proport<br>RFORMALION, A - /<br>DO CI | inued i<br>tor to<br>ven; at<br>id retur<br>ional t<br>ice-ourp<br>ice-ourp<br>ice-ourp | comminuto<br>osolute ma<br>n elbows<br>o HP outp<br>ut<br>ALUE) | or availabl<br>aximums up<br>are optior<br>out.<br>OPERATIN<br>RANGES<br>(TEMP, OTH<br>All weathe              | to 100%<br>to 100%<br>mal extras<br>mal extras<br>mal extras<br>mal extras       | re 1<br>23<br>000<br>000<br>000<br>33<br>000<br>500<br>500<br>500<br>500<br>500                         | . Model 11<br>7-7/8"<br>(return<br>. Plumbin.<br>Models<br>ERATION<br>. Periodic<br>. Grease<br>. Cutter<br>replace | 00 has 5-3<br>inlet with<br>elbows, s<br>g and elec<br>350 and 50<br>& MAINTE<br>c maintena<br>ports allo<br>replacemen | <pre>/16" inlet wi<br/>13-1/2" flam<br/>me dimension<br/>trical skills<br/>have concre<br/>NANCE REOL<br/>nce necessary<br/>w extended un<br/>t simple; any<br/>TTING FORCE (</pre>                                                | ge; 250, 10'<br>required fo<br>te inlet and<br><b>JIREMENTS</b><br>(not daily<br>attended ope<br>sewage plar | " inlet, 16"<br>or installati<br>d flow-throug<br>).<br>eration. | flange<br>ion.<br>Jh trougl |
| 1. 180<br>sha<br>ibl<br>2. Ave<br>gre<br>COSTS<br>1. Ext<br>2. Ele<br>MODEL<br>NUMBER<br>(MAJOR)<br>100 | P retur<br>ft exte<br>e place<br>rage maa<br>ater ca<br>ended d<br>ctrical                                                                                                                                                                                                                                                                                                                         | n elbow<br>nsions<br>ments.<br>Ximum f<br>pacitie<br>rive sh<br>costs<br>NICAL PEI<br>REDUCT | is (cont<br>from mo<br>lows gi<br>is-<br>afts ar<br>proport<br>RFORMALION, A - /<br>DO CI | inued i<br>tor to<br>ven; at<br>id retur<br>ional t<br>ice-ourp<br>ice-ourp<br>ice-ourp | comminuto<br>osolute ma<br>n elbows<br>o HP outp<br>ut<br>ALUE) | OPERATIN<br>RANGES<br>(TEMP, OTH<br>All weather<br>indoor or<br>Outdoor                                        | e for fle<br>to 100%<br>mal extras<br>en; Noto<br>nois<br>No.o                   | re 1<br>23<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>5<br>5<br>5<br>5<br>5<br>5<br>5    | . Model 11<br>7-7/8"<br>(return<br>. Plumbin.<br>Models<br>ERATION<br>. Periodic<br>. Grease<br>. Cutter<br>replace | 00 has 5-3<br>inlet with<br>elbows, s<br>g and elec<br>350 and 50<br>& MAINTE<br>c maintena<br>ports allo<br>replacemen | <pre>/16" inlet wi<br/>13-1/2" flam<br/>me dimension<br/>trical skills<br/>0 have concre<br/>NANCE REQU<br/>NAVE REQU<br/>NAVE REQUESTION<br/>NAVE REQUESTION<br/>We extended un<br/>t simple; any<br/>rTING FORCE (<br/>163</pre> | ge; 250, 10'<br>required fo<br>te inlet and<br><b>JIREMENTS</b><br>(not daily<br>attended ope<br>sewage plar | " inlet, 16"<br>or installati<br>d flow-throug<br>).<br>eration. | flange<br>ion.<br>Jh trougl |
| 1. 180<br>sha<br>ibl<br>2. Ave<br><b>COSTS</b><br>1. Ext<br>2. Ele<br>MODEL<br>NUMBER<br>(MAJOR)<br>100 | <pre>P retur<br/>ft exte<br/>e place<br/>rage ma<br/>ater ca<br/>ended d<br/>ctrical<br/>TECH<br/>(R = 3<br/>SODS<br/>NA<br/></pre>                                                                                                                                                                                                                                                                | n elbow<br>nsions<br>ments.<br>Ximum f<br>pacitie<br>rive sh<br>costs<br>NICAL PEI<br>REDUCT | IS (cont<br>from me<br>lows gi<br>is -<br>afts ar<br>proport<br>DD ci<br>NA N<br>"        | inued i<br>tor to<br>ven; at<br>id retur<br>ional t<br>ice-ourp<br>ice-ourp<br>ice-ourp | comminuto<br>osolute ma<br>n elbows<br>o HP outp<br>ut<br>ALUE) | OPERATIN<br>RANGES<br>(TEMP, OTH<br>All weathe<br>indoor or<br>                                                | e for fle<br>to 100%<br>nal extras<br>eR) Ou<br>er; Hoto<br>nois<br>So o<br>No o | re 1<br>23<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>5<br>5<br>5<br>5<br>5<br>5<br>5    | . Model 11<br>7-7/8"<br>(return<br>. Plumbin.<br>Models<br>ERATION<br>. Periodic<br>. Grease<br>. Cutter<br>replace | 00 has 5-3<br>inlet with<br>elbows, s<br>g and elec<br>350 and 50<br>& MAINTE<br>c maintena<br>ports allo<br>replacemen | V16" inlet wi<br>13-1/2" flam<br>me dimension<br>trical skills<br>Dhave concre<br>NANCE REQU<br>NANCE REQU<br>NAME REQUESTION<br>NAME FORCE (<br>163<br>134                                                                        | ge; 250, 10'<br>required fo<br>te inlet and<br><b>JIREMENTS</b><br>(not daily<br>attended ope<br>sewage plar | " inlet, 16"<br>or installati<br>d flow-throug<br>).<br>eration. | flange<br>ion.<br>Jh troug  |



Accessories

POLLUTION CONTROL INC. ACTIVATOR N. WING, LUNKEN AIRPORT ADMINISTRATION BLDG. CINCINNATI, OHIO 45225 (513) 871-2754 Attn: Mr. Fred Tipton, Vice-President **SEWAGE COMMINUTORS** FEATURES OPERATION EATURES
1. Notor driven aluminum comminuting device for in-line flow-through disintegration and reduction of waste particles to 1/4" or smaller with 12-1/4" cutter teeth.
2. Westinghouse 1/2 HP right angle gear motor; integral type with single reduction worm gearing Class Ko. 3.
3. Programmed timing control stops unit in case of clogging, overload protection circuitry.
4. Sewage can overflow through top inlet trough to flow chamber and discharme in zeas of nonce failure Sewage enters comminutor through open top inlet trough. Large pieces are sheared and ground between stationary and 2. Large pieces are sheared and ground between sectionary of revolving cutter teeth.
 Ground sewage (less than 1/4") passes through revolving sewage screen to discharge at bottom of housing.
 Overflow passes through open top inlet to flow chamber Tocated outside of comminutor prior to treatment or pumping (in case of breakdown or over-surge). and discharge in case of power failure. 5. Revolving aluminum screen with 4 adjustable cutter teeth. DINEMBONE COSTS (DOLLARS) UTILITY REQUIREMENTS TANK DESIGN MODE OPERATING PACIT APACIT LIFETIME NUMBER UGG. LIST INSTALL WATER (LB.) OPERATE ELECTRICITY SUPPLIES ENGTI (MAJOR) MOTH HEIGH (GPM) GAL IFOR (VRL) CORT 0087 RATING PRESSURE FACTORY 10 115/230 Flow-P-5 18" 11" 30<sup>1</sup>8 110 0-175 NA None ٥r through 30 230/460 137 ... e. P-8 140 0-300 .... <sup>1</sup>Minimal flow-through pressure necessary. INSTALLATION REQUIREMENTS SIZING & GROWTH POTENTIAL P-5 has 6" ID inlet with 11" flange and 5 1/8" outlet; P-8 has 8" ID inlet with 12 1/2" flange and 8 1/8" outlet. (Return 1. Both sizes available with 180° return elbows (continued inline flow; same direction). 2. Drive shaft extensions from motor to comminutor available for elbow outlet has same dimensions as inlet.) 2. Electrical and plumbing skills needed for installation. greater flexibility. **OPERATION & MAINTENANCE REQUIREMENTS** COSTS Extended drive shafts and return elbows are optional extras.
 Electrical costs are for 1/2 HP continuous operation. 1. Periodic maintenance necessary; included in package plant service contract. TECHNICAL PERFORMANCE-OUTPUT MODEL OPERATING STANDARDS NOISE (R + % REDUCTION, A + ACTUAL VALUE) BANGES -----CODES MET (MAJOR) TEMP, OTHER 800, 88 DO CO0 40 tor Temperate: 8-5 NA NĄ NA NA outdoor noise. AGMA operation No odors ... ... ... . п ... P-8 WARRANTIES, GUARANTEES, & SERVICE **TECHNICAL PERFORMANCE**  Gear motor approved by American Gear Manufacturers Assoc.
 P-5 nrovides up to 707 in/lb of torque @ 35 RPM and P-8 up to 773 in/lb of torque @ 23 RPM. 1. I year warranty on parts for defective material or workmanship to be determined by manufacturer. All labor costs extra. 2. PCI distributors offer plant service contracts covering comminutor maintenance. OMMENTS ACCURATE AS OF July 31, 1972 1. Each comminutor furnished with spare set of stationary and rotating cutters. COMMENTS NOTE: The above data are based on information supplied by the manufacturer. Demonstration Water Project cannot assume responsibility for their accuracy. Please contact manufacturer for latest specifications and prices.

# Appendix C: Survey of Available Equipment

| Advanced Drainage Systems ,Inc.<br>1880 MacKenzie Drive<br>Columbus, Ohio 43220                      | ADS Tubing                                                                                                         | 278                      |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>Aera-Filt Systems, Inc.</b><br>P.O. Box 567<br>Lafayette, Indiana 47901                           | Sewerless Toilet                                                                                                   | 170, 296                 |
| Air Vac/Division of National Homes<br>Construction Corp.<br>P.O. Box 109<br>Rochester, Indiana 46975 | Air Vac Vacuum Sewage System                                                                                       | 140                      |
| <b>Allenaire, Inc.</b><br>379 Niles-Cortland Road, S. E.<br>Warren, Ohio 44484                       | The Domestic Standard (Blower)<br>Septi-Care                                                                       | 242<br>172               |
| <b>American Precast Corp.</b><br>164 Meadow Street<br>Framingham, Massachusetts 01701                | Ameration Chamber<br>Septic Tanks                                                                                  | 280<br>156               |
| <b>Andstor International</b><br>Virebergsvagen 7, Box 1023<br>S-171 21 Solna 1, Sweden               | Multrum (Converter Composter)                                                                                      | 134                      |
| <b>Anticimex Bolagen</b><br>Vasagatan 46, Fack<br>101 10 Stockholm 1, Sweden                         | Wallax (Precipitation Plant)                                                                                       | 158                      |
| <b>Aquanox, Inc.</b><br>140 Sylvan Avenue<br>Englewood Cliffs, New Jersey 07632                      | Aquanox (Oxidation Plant)                                                                                          | 208                      |
| <b>AWT Systems, Inc.</b><br>910 Market Street<br>Wilmington, Delaware 19899                          | Fluidhearth                                                                                                        | 206                      |
| <b>BIF Sanitrol</b><br>P.O. Box 41<br>Largo, Florida 33540                                           | BIF Lagoon Monitor<br>BIF Waste Disintegrator                                                                      | 312<br>310               |
| <b>BiO₂ Systems, Inc.</b><br>1049 Central<br>Kansas City, Missouri 64105                             | Sani-Cell                                                                                                          | 210                      |
| <b>Cantex Industries</b><br>P.O. Box 340<br>Mineral Wells, Texas 76067                               | Tex-A-Robic — Extended Aeration<br>Tex-A-Robic — Stabilization<br>Tex-Vit — Pump Stations<br>TF-2 Tertiary Filters | 212<br>214<br>142<br>216 |
| Capital Controls Co.<br>Advance Lane<br>Colmar, Pennsylvania 18915                                   | Advance Chlorinators                                                                                               | 264                      |
| <b>Cromaglass Corporation</b><br>Box 1146<br>Williamsport, Pennsylvania 17701                        | Cromaglass — Filter Unit                                                                                           | 174                      |

# 324

Index of Manufacturers

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## Index of Manufacturers

| <b>Diamond Shamrock Corporation</b><br>T. R. Evans Research Center<br>P.O. Box 348<br>Painesville, Ohio 44077          | Sanuril — Chlorinator                                                         | 266               |
|------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------|
| <b>Dravo Corporation</b><br>Water and Waste Treatment Department<br>One Oliver Plaza<br>Pittsburgh, Pennsylvania 15222 | Dravo Minipack                                                                | 218               |
| Eaton Corporation<br>Controls Division<br>191 East North Avenue<br>Carol Stream, Illinois 60187                        | Dole Flow Controls                                                            | 298               |
| Environmental Pollution Control<br>Div. of Geo. A. Hormel & Co.<br>P.O. Box 800<br>Austin, Minn. 55912                 | 3-Stage RBS                                                                   | 220               |
| Environmental Services, Inc.<br>Granite and West Streets<br>Midland Park, New Jersey 07432                             | Waste-Tamer                                                                   | 176               |
| <b>Extended Aeration Co.</b><br>P.O. Box 822<br>Huntington, West Virginia 25712                                        | Extend-Aire                                                                   | 222               |
| Fairfield Engineering and Manufacturing Co.<br>601 West Kirkwood Street<br>Fairfield, Iowa 52566                       | Aerob-A-Jet                                                                   | 244               |
| Fischer & Porter Co.<br>Warminster, Pennsylvania 18974                                                                 | F & P Chlorinator                                                             | 268               |
| <b>The Flintkote Co.</b><br>Pipe Products Group<br>Orangeburg, New York 10962                                          | Orangeburg Pipe                                                               | 282               |
| Flygt Corporation<br>129 Glover Avenue<br>P.O. Box 857<br>Norwalk, Connecticut 06856                                   | Flygt ENH-10 (Level Sensor)<br>Flygt Pumps<br>Flygt 4291 (Stabilization Unit) | 314<br>144<br>178 |
| <b>Franklin Research</b><br>1220 Sixth Street<br>Berkeley, California 94710                                            | Effluent Diverter<br>Level Sensor                                             | 284<br>316        |
| <b>GAEA Corporation</b><br>P.O. Box 346<br>Tualatin, Oregon 97062                                                      | Batch-Treat                                                                   | 224               |
| W. R. Grace & Co.<br>Davison Chemical Division<br>10 East Baltimore Street<br>Baltimore, Maryland 21203                | Ozone Generators                                                              | 270               |

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# Appendix C: Survey of Available Equipment

| <b>H &amp; B Industries, Inc.</b><br>219 North Detroit Avenue<br>Tulsa, Oklahoma 74120                 | Tulsa Unit (Pressurized System)                                                                                                                          | 146                             |
|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| <b>Hancor, inc.</b><br>P.O. Box 1047<br>Findlay, Ohio 45840                                            | Channel Flow                                                                                                                                             | 286                             |
| Hitachi Corporation<br>c/o Marubeni America Corporation<br>200 Park Avenue<br>New York, New York 10017 | Hi-Bakkie                                                                                                                                                | 182                             |
| <b>Honeywell Industrial Division</b><br>1100 Virginia Drive<br>Fort Washington, Pennsylvania 19034     | Honeywell Chlorinators                                                                                                                                   | 272                             |
| <b>Hydrajector Corporation</b><br>P.O. Box 30516<br>Santa Barbara, California 93105                    | Hydrajector (Mixer)                                                                                                                                      | 246                             |
| Hydromatic Pump Co.<br>Hayesville, Ohio 44838                                                          | Hydr-O-Grind                                                                                                                                             | 148                             |
| <b>Jet Aeration Co.</b><br>750 Alpha Drive<br>Cleveland, Ohio 44143                                    | Jet Home Plant<br>Jet Package Plant                                                                                                                      | 180<br>226                      |
| Kenics Corporation<br>One Southside Road<br>Danvers, Massachusetts 01923                               | Static Aerators<br>Static Mixer                                                                                                                          | 248<br>250                      |
| Lamere industries, inc.<br>227 North Main Street<br>Walworth, Wisconsin 53184                          | Destroilet                                                                                                                                               | 136                             |
| <b>McDowell Manufacturing Co.</b><br>P.O. Box 665<br>DuBois, Pennsylvania 15801                        | Aquatower                                                                                                                                                | 288                             |
| <b>McGraw-Edison Co.</b><br>Fibre Products Division<br>P.O. Box 238<br>West Bend, Wisconsin            | M-E Permaline                                                                                                                                            | 290                             |
| <b>Microphor, Inc.</b><br>475 East San Francisco Avenue<br>Willits, California 95490                   | Annelgester ·<br>Low Flush Toilet                                                                                                                        | 184<br>300                      |
| Millipore Corporation<br>Bedford, Massachusetts 01730                                                  | Coli-Count                                                                                                                                               | 318                             |
| Multi-Flo, Inc.<br>500 Webster Street<br>Dayton, Ohio 45401                                            | Multi-Flo FT — Filter Unit<br>Multi-Flo Pumps<br>Multi-Flo RS-1 — Filtration Unit<br>Multi-Flo RS-2 — Filtration Unit<br>Multi-Flo SA — Floating Aerator | 186<br>150<br>302<br>304<br>252 |

1

## Index of Manufacturers

| <b>Nayadic Sciences, Inc.</b><br>Village of Eagle<br>Uwchland, Pennsylvania 19480                                                                                            | Nay-Sci, The Answer                                                                                      | 188                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------|
| New England Wastewater Systems, Inc.<br>Route 100/P.O. Box 412<br>West Dover, Vermont 05356                                                                                  | News 1000G (Aerobic Treatment)                                                                           | 190                      |
| Nishihara Environmental Sanitation Research<br>Corp., Ltd.<br>c/o Dr. Takashi Asano<br>Montana State University<br>Department of Civil Engineering<br>Bozeman, Montana 59715 | Neo Aerobic Tanks — AR<br>Neo Comminutors<br>Neo Septic Tanks — ST                                       | 192<br>320<br>160        |
| <b>Plast-A-Form Corporation</b><br>225 Valley Street<br>Williamsport, Pennsylvania 17701                                                                                     | Plast-A-Form (Aeration Unit)                                                                             | 194                      |
| Polcon Corporation<br>222 Cedar Lane, Suite 305<br>Teaneck, New Jersey 07666                                                                                                 | Helixor (Aeration Tubes)                                                                                 | 254                      |
| Pollution Control, Inc.<br>North Wing, Lunken Airport Administration<br>Building<br>Cincinnati, Ohio 45226                                                                   | Activator (Diffused Air Plant)<br>Activator (Air Diffuser)<br>Activator (Comminutor)<br>Roots AF Blowers | 228<br>258<br>322<br>256 |
| Pollution Control Systems, Inc.<br>P.O. Box 401<br>10575 West 120th Street<br>Broomfield, Colorado 80020                                                                     | CT-86 (Tertiary Home Plant)                                                                              | 196                      |
| <b>Pollutrol Technology, inc.</b><br>Thompson's Point Industrial Park<br>P.O. Box 3727<br>Portland, Maine 04104                                                              | Microx (Aeration Unit)<br>Puritrol (Package Plant)                                                       | 198<br>230               |
| Purestream Industries, Inc.<br>1450 Dixie Highway<br>Covington, Kentucky 41011                                                                                               | Purestream (Aeration Plant)                                                                              | 232                      |
| Rainbird Sprinkler Manufacturing Co.<br>7045 North Grand Avenue<br>Glendora, California 91740                                                                                | Rainbird                                                                                                 | 292                      |
| The Septivator Co.<br>2834 Lexington Avenue<br>Lexington, Ohio                                                                                                               | Septivator (Tank Heater)                                                                                 | 162                      |
| Suburbia Systems, Inc.<br>3785 West 95th Street<br>P.O. Box 6217<br>Leawood, Kansas 66206                                                                                    | Darac (Aeration Plant)<br>Marac-100 (Package Plant)<br>Monotank<br>Turboil Aerators                      | 236<br>234<br>164<br>260 |
| <b>Thiokol Chemical Corp.</b><br>P.O. Box 524<br>Brigham City, Utah 84302                                                                                                    | Nonbiological Waste Treatment<br>Thiokol-MPB-10                                                          | 238<br>200               |

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# Index

(Numbers in italics refer to pages on which Figure or Table appears.)

Absorption capacity, of soil, 15 Activated sludge process, conventional, 7, 54-56, 55 mixed liquor, 7 sensitive to shock loading, 8 contact stabilization modification, 8, 54-56, 55 requires close supervision, 8 extended aeration modification, 8, 54-56, 55 Activator --- diffused air package plant, 228 Activator - hydro-chek air diffuser, 258 Advance chlorinators, mounted, in-line chlorinators, 264 Advanced wastewater treatment (AWT), 3 (see also tertiary treatment) Aeration devices, 240 floating aerator, 240 helical flow aerators, 240 motor and blower unit, 240 Aerobacter aerogenes, reacts identically to E. Coli in simple tests, 5 Aerob-A-Jet --- mechanical oxidation unit. 244 Aerobes, 5 Aerobic tanks 6-7, 98-119, 166-168 composite systems and mounds instead of, 47 costs, 167-168 higher than septic tank, 167 effluent may demand less of soil than septic tank effluent, 7 performance, 168 without attention, can become dangerous polluters, 168 scaled down versions activated sludge plants, 47 septic tanks recommended instead of, 47 servicing, 168 sizing building lot for, 98-119 sludge build-up, 6

Aggregation, in soil, 12 silica and sesquioxides, 12 synthetic, 12 Air Vac --- vacuum sewage system, 140 Algae, 4 Anaerobes, 5 Anderman, 82 Annelgester - redwood trickling filter unit, 184 Annualization, for cost comparisons, 93 for hypothetical home aerobic plant, 96 Aquanox --- controlled oxidation package plant, 208 Bacteria, 4 complete sterilization under precisely controlled laboratory-type conditions necessary to kill them, 5 their hardiness, 5 Bartelli, 19 Batch-Treat - modular extended aeration package plant, 224 Bernhart, 26, 98 design loading of 55 GPCD, 43 Biochemical oxygen demand (BOD), 2-3 how measured, 3 typical values, 39-41, 42-43 Bio-Ventm Bed System, 63-64, 65 Bio-Vent Trench System, 63-64, 66 Bouma, mound design, 61 Breathers (see breezers) Breezers, 98 in mounds, 60 Building lots, sizing for on-site disposal system, 98-119 sizing a soil absorption system, 49-50, 50

#### Index

California State Department of Public Health, guidelines for hillside spray irrigation, 74 survey of sewage disposal, 81 results, 81-82

Central plants, 34

Centralized systems, sewers, average length of, 53 costs, 53, 88-97, 89, 90, 91, 92 treatment plant, 53 loading schedule, objective, 54

Cesspools, 6, 45 cost, more expensive than septic tanks, 45

Chlorination, 262 (see also disinfection) inadequacy in killing disease-causing microorganisms, 3 units poorly maintained, 81

Clay, 11 (see also soils)

Cochran, 71, 74

Coliform test, coliform count, contamination of water inferred from, 5 not infallible, *Aerobacter aerogenes* reacts identically to *E. Coli*, 5

Comminutors, 67

Composite system, using pressure sewers, 66-69 design, basic features, 66-67 parameters, 67-69

Contact stabilization modification, 7 conventional activated sludge process and extended aeration modification, compared to, 54-56, 55

Conventional activated sludge plants, "belching," 54 bloating, 54

Conventional activated sludge process (see activated sludge process)

Costs, aerobic tanks, 93 annualization, for cost comparisons, 93 for hypothetical home aerobic plant, 96 central plant, 88-91, 89, 90, 91 less costly on per house basis than on-site, 88 piping costs may make unfeasible, 88 piping sewage to, 88, 91 comparisons, 93-94 components that should be costed, summary for all systems, 94 on-site systems, 93 package plants, 93 sewers, 88, 91 construction, 92, 92 septic tanks, 93

Cromaglass - diffused air, filter bag unit, 174

CT-86 — activated sludge, tertiary treatment home plant, 196

DARAC --- diffused air extended aeration package plant, 236 Destroilet, incinerator toilet, 136 Disinfection, add-on process to most plants, 34 design and development needs improvement. 34, 262 devices, 262-263 present standards and practices do not insure complete disinfection, 262 dispensers, should be outfitted with alarms, 34 methods, chlorination, 3, 262 irradiation, 3 ozonation, 3, 262 pasteurization, 3, 262 Dissolved oxygen, 5 Domestic Standard-compressed oilless air blower, 242 Dravo Minipack-trickling filter media treatment unit, 218 Dual fields, for soil absorption systems, 51, 60 effluent diverter valve, 60, 284 Effluent (see also sewage) discharge untreated to surface waters illegal, 45 disposal, 35 in sizing system, 35 Eilers, 88-92, 89, 90, 91 Escherichia coli, 5 presence in water index of contamination by human wastes, 5 Evapotranspiration (see also soil absorption system and mounds)

Bernhart, 99-119 evaporation, lake, 25 potential, 25 Hancor systems, 62-66, 65, 66 measurement of, 25 class A pan, 25 role of in soil absorption system, 24-27, 27

Extend-Aire—diffused air extended aeration package plant, 222

Extended aeration modification, 8 conventional activated sludge process and contact stabilization process, compared to, 54-56, 55

F&P Chlorinators-mounted, in-line chlorinators, 268

#### Facultatives, 5

Fire protection, distribution system, separate mains, 77 fire-flow requirements, 76 four-hour fire flow needs, 77 use of treated wastewater for, 75-78

Flocs, 7

plant, 226

### Index

Flood plain (flooding), 24 Kolega, 84 Flow-control, 98 consumption reduction techniques, 294-295 flow reducing valve, 298 water pressure reducing valve, 306 Fluid hearth-physical chemical treatment plant, 206 suitable, 28 Flygt 4291-diffused air, contact stabilization unit, 178 Flygt Pumps-sewage lift pumps, 144 soils for, 29 Fungi, 4 Grinder-pumps, 67, 146, 148, 150 cost. 67 Ground water level, 23, 28, 48 Hancor, Inc., 62-66, 65-66 Helixor-helical component aeration tubes, 254 Leaching pit, 45 Hi-Bakkie-disk aeration, activated sludge system, 182 "Honey dippers," 84 "Honey wagon," 84 Honeywell Chlorinators-mounted, in-line chlorinators, 272 Huckle, 70 Hydrajector-mixer, 246 Hydr-O-Grind-sewage grinder pump systems, 148 Imhoff tanks, septic tank, community analogue of, 7 Imperial gallon, 98 Incineration, for disposal human waste, 1 Incinerator toilet, 133 Infiltration, 13, 15 rates, 15 Influent, 25 volume, dependent on standard living of people uals in, 79 involved, 36 estimates, 30 to 100 GPCD, 36, 36 Interceptor tanks, 67 Intermediate treatment, removal suspended solids and colloidal matter, 3 Inverted Channel Air-Flow™ System, 62-63, 65 Ionizing radiation, to kill microorganisms, 262 Anderman, 82 Irradiation, use of, 3 Irrigation (see spray irrigation) Jet Home Plant-mechanical aeration unit, 180 Jet Package Plant-aerobic package treatment Microorganisms

Lagoons, design requirements, 72 flood areas not acceptable sites, 28 must be kept well mixed. 7 organic matter, moderate to high amounts not slope allowable, 28 soil factors that affect, 26-29 soil requirements for basin floor, 27-28 wastewater in small communities, for treating, 7 water table depth may be critical, 28 Land disposal, evapotranspiration, 58, 59 ground water, effects on, 12, 18, 19, 33, 35 Hancor systems, 62-66, 65, 66 mounds, 57-61 spray irrigation, 69-75 subsurface disposal, 45, 47-52 Machmeier, Roger E., "gopher mounds", 61, 63, 64 Manual of Septic Tank Practice, 36, 47 Maintenance, aerobic systems, air compressors require routine inspection, 80 failure, NSF Standard 40 requires means of alarm to signal, 80 service facilities, many manufacturers trying to organize association that would provide, 80 service inadequate, 80 sludge bulking, 80 management organizations, development of most needed advance in small wastewater treatment system practices, 82 needed in rural areas, 79 package plants, efficiency affected by absence of servicing, 81 service problems, 80 survey of sewage treatment plants in California, 81-82 rural areas, depends upon cooperation of individrural situations, generally not provided in, 1 septic tank systems emptying, 84 inspection for sludge build-up, 46 septage, disposing of, 84 Management organizations, need for, 83-84 performance standards for, 84 "total management" concept of Winneberger and criteria for, 82-83 Manufacturers, Index of, 324 MARAC-100-mansard-roofed package plant, 234

algae, oxygen consumption, 4

#### Index

grow in water containing sewage, 4 photosynthesis, capable of, 4 bacteria diseases caused by, 4 their hardiness, 5 constitutents of sewage, as, 4 digesters of sewage, as, 4 fungi, 4 metazoa, 4 snail fever caused by, 4 protozoa, 4 diseases caused by, 4 viruses, 4 Microx-batch process extended aeration unit, 198 Mixed liquor, 7 Monotank-post septic tank aerobic unit, 164 Morris, 19 "Most conservative approach, for sizing soil absorption system, 50-51, 50 Mounds, design, 57, 58 criteria, 58-60, 59 over slowly permeable soil or hardpan, 61, 62 over creviced or channeled bedrock, 61, 62 dimensions of, 60 distribution lines, conventional systems spread effluent unevenly, 60 pipes, small diameter plastic, use of, 60 dosing schedule, 60 dual trenches, Winneberger recommends, 60 diversion valve for, 60 evapotranspiration, moisture removed by, 58 "gopher mounds," 61, 63, 64 ground surface, preparation of, 61 history of, 57 pump should be corrosion resistant, 60 soils for, 60 Multi-Flo FT-aerated flow-through filter unit, 186 Multi-Flo Pumps-submersible sewage pumps, 150 Multi-Flo SA-floating aerators, 252 Multrum, 134 National Sanitation Foundation, performance standards for wastewater technology, 128-131 purpose, 128 National Sanitation Foundation Testing Laboratory, inc., 128-131 Nay-Sci, The Answer-extended aeration treatment unit. 188 Neo Aerobic Tanks-AR-aerobic treatment plant, 192 Neo Septic Tanks-ST-aerobic-anaerobic septic tanks, 160 Newbury, 19

News 1000G—individual aerobic treatment unit, 190 Nonbiological Waste Treatment System--shipboard chemical, 238 Ozone generators-ozonators-corona generators. 270 Ozone, use of, 3, 262 Package treatment plants, 1, 54-56, 202-204 biological disk, variation of trickling filter operation, 202 cost. 202-203 lagoons, use of, 202 maintenance, imperative of regular, 203 performance, 203-204 ponds, waste stabilization, 202 shells of residential homes, use of, 202 Parent material, 10, 18 (see also soils) Pasteurization, 3, 262 Percolation, 13, 16-18 Percolation test, 16 (see also soils) Permeability, 13, 15, 18, 23 determining factors, 15 Physical-chemical plants, 8 Pit privy, 1, 44 prefabricated version, 133 Plast-A-Form-filtered extended aeration unit, 194 Plumbing (see also water consumption reduction techniques) vent pipes, 32 water traps, 32 Pressure sewers, 66-69 air relief valve, 68 composite systems, 66-69 flushing tanks, 69 gas-binding of lines, 68 grinder pumps, 67, 148 interceptor tanks, 67 pumps, 142, 148, 150 scouring velocity, 68 septic tank effluent, 67 small diameter pipe, use of, 66 vacuum collection system, 68, 140 Primary treatment, removal settleable solids, 3 Privy (see pit privy) Protozoa, 4 diseases caused by, 4 Purestream-extended aeration package plant, 232 Puritrol-batch process package plant, 230

Repair (see maintenance)

#### Index

337

Roots AF Blowers-two-lobed rotary blowers, 256 Rose, Cecil W., 67-69 Butkowski, 43 Salvato, 57, 133 Sand, particles, 11 Sani-Cell-activated sludge small package plant, 210 Sanitary sewer, 33 Sanuril-pellet feed chlorinator, 266 Secondary treatment, reduction BOD through biological digestion of the sewage, 3 Seepage pits, 45 costs, 45 Self-contained systems, holding tank, 133 incinerator toilet, 133 monthly cost, 133 privy, 133 prefabricated version, 133 Sepp. 74 Septage, 84 disposing of, 84 properties of, 84, 85, 85, 86 treating, incremental costs, 87 volume, per capita per year, 86-87 Septi-Care-aerobic treatment unit, 172 Septic tank system, 1 (see also soils and soil absorption system) sizing building lot for, 98-119 sizing soil absorption system, 49-50, 50 Septic tanks, cost, 6 improvement needed, 152 failure of system, reasons for, 45-46 locating, 46 most frequently used on-site water carriage disposal system, 45 maintenance, 46 Nishihara Environmental Sanitation Research Corp., Ltd., 160 precast concrete septic tanks, 156 pumping, when necessary, 46, 152 shapes, 153 Septivator-septic tank heater, 162 Sewage (see also sewage treatment) biological mechanisms in, 5 BOD, 2-3 typical values, 39-41, 42-43 composition of, 2 disease, as source of, 4-5 domestic, 2 flow rates, 36, 36-41 100 GPCD may be too high, 42 microorganisms in, 4

pumped under pressure or vacuum, 138 settleable solids, removal of, 3 stabilized, 2 strength of, 41-42 volume, bathtubs, basins, shower, 2 laundry and kitchen, 2 toilets, 2 Sewage treatment aerobic. 5 anaerobic, 5-6 BOD, removal of, 3 centralized, 31 colloidal matter, removal of, 3 composite systems, 31 dissolved matter, removal of, 3 levels of 3 on-site, 31 aerobic tanks, 6-7 cesspools, 6 factors to consider in selecting system, 7 incineration, 6 pit privy, 6 septic tank, 6 (see also septic tanks) primary, 31 process, goal of, 2 processes available to rural communities, 31 secondary, 31 success dependent upon maintenance active culture microorganisms, 3 sewage flow rates, GPCD, 36, 36-41 100 GPCD may be too high, 42 sewers, 31 (see also pressure sewers) access for clean-out, 32 check valve, 32 gases, venting, 33 joints, 32 mechanical failure, signalling, 33 percentage of population not served by, 1-2 percentage of population served by, 1 pipe protection, 32 sanitary, 33 seepage of water into, 33 specifications, 32 storm, 33 vacuum-type system, 138 sizing a system, key design parameters, 43 lagoons, 72 oversizing, 43-44 soil absorption system, 49-51, 50 spray irrigation system, 71-72 Sewage treatment plants, urban, 1 Sewage works design criteria, 30 functions, 30

planning, 30 Sewerage (see sewage works)

Sewerless toilet, 170

1

#### index

Silt, 11 Sludge, "age", 54 bulking, 168 disposal of, 35 surge loadings, sensitive to, 53 "wasting" by conventional activated sludge plants, 56 Smith, 88-92, 89, 90, 91 Soil horizons, 10 Soil maps, advantages of using in determining soil suitability for absorption system, 19 as substitutes for percolation tests, 19 typical map, 20 Soil surveys, contents of, 19 use of in planning systems, 19 Soils, absorption capacity function of soil structure, 15 aggregation (see structure) classification systems, 9 clay, 11 clogging, 13, 18, 24, 48, 56 definition, 9 drainage, color clue to wetness, 14 dull gray colors, 14 factors which determine, 14 importance to wastewater application, 13 internal, 13-14 bright colors, 14 limonite, 14 mottled color, 14 poorly-drained, 14 well-drained, 14 formation, 10 horizons, 10 subsoil, 10 substratum, 10 surface soil, 10 how formed, 9 infiltration, 15 lagoons, flood areas not acceptable sites, 28 organic matter, moderate to high amounts not suitable for, 28 rating of soils for, 29 requirements for basin floor, 27-28 slope allowable, 28 soil factors that affect, 26-29 water table depth may be critical, 28 limitation ratings for use in subsurface absorption fields, 21 parent material, underlying, 18 dense substrata may prevent vertical movement of fluids, 18 highly fractured may promote too rapid movement of water and contaminate ground water, 18 suitability classifications, 18 thickness of and nature of influence water movements, 18

percolation, 15, 16-18 relationship between permeability and, 18 percolation rate, 16 from study soil morphology and soil profile, 17 permissible ranges for, 17 sizing a system, 50 percolation test, 16 false rates, 16 inaccuracies in, 17 infiltration and permeability, measure of, 17 measures rate movement of water in soil, 17 reliable results, for, 17 permeability, 15 determining factors, 15 evaluation of, 16 relationship between percolation and, 18 properties wastewater renovation depends most noqu depth, 11 internal drainage, 11 slope, 11 structure, 11 texture, 11 pores, 9 pore space, 9 rating for subsurface absorption, 20-21, 22 sand particles, 11 skeletal portion, 9 soil maps advantages of using in determining soil suitability for absorption system, 19 as substitutes for percolation tests, 19 not detailed enough to predict limitations for specific site, 20 typical map, 20 soil particles, 11 soil profile, 10 nature of determines capacity to recycle wastewater, 10 soil surveys, contents of, 19 use of in planning systems, 19 structure, 9, 12, 13 determines amount water entering soil, 13 non-aggregated (structureless), 13 silica and sesquioxides, 12 synthetic, 12 types of, 13 texture how determined in the field, 12 USDA textural classification, 11 thickness, 9 voids, 9 water movement, 14-15 factors which influence pattern of, 15 water retention, 14 wetness (see drainage) Soil absorption system, 623, 47-48 design objective, 48 dual fields, 51

Index

evapotranspiration, 58, 59 Hancor systems, 62-66, 65, 66 measurements and estimates of, 25 mounts, 57-61 role of, 24-25 shrubs will aid, 52 volume that can be disposed of by, determining, 25 failure, reasons for, 24 filled land not suitable, 52 flood plain not suitable, 24 ground surface should be arched slightly, 52 guidelines, 48-51 depth to rock, sand, gravel, 48 different kinds of soil, 48 ground water level, 48 proximity to other water bodies, 23, 49 sizing a system, 49-50 slope, 49 soil absorption capacity, 49 soil aeration, 48 soil permeability, 49 loading uniformly, 51 performance, factors which affect, 23 proximity to other water bodies, 23, 49 septic tank absorption field, selecting a site for, 22 serial distribution. 23 site, guidelines for selecting, 23 sizing a system, 49-51, 50 soils rating for subsurface absorption, 20-21 classification for soils, 21 wastewater application, general principles for, 18-19 water softener backwash can ruin field, 52 Solids, settleable, removal of, 3 suspended, 56 removal of, 3 BOD associated with, 3 Spray irrigation, 69-75 area required for, 71-72 rules of thumb, 71 temperatrue, effects of, 71-72 total size of installation, 72-73 colfiorm counts required, 69 components corosion, materials should be resistant to, 73 lines, 73-74 pumps, 73 screens, 73 settling tank, 73 sprinkler nozzles, 73 sprinklers, 74 fertilizer, use as, 70 lagoon, use of prior to spraying, 70, 72 design requirements, 72 surface area required for 1,000 population equivalent, 73 loading, 71 with use of lagoon, 72

precautions, 69 process, 69, 69 protection of neighbors buffer zones, 73, 75 fencing, 75 trees or tall shrubs, use of, 73 soil management, 70 soil must have ground cover, 70 soil suitability for, 70 spraying, scheduling, 74-75 Stabilization pond (see lagoons) Static Aerators-helical component aeration tubes, 248 Static mixer-helical component aeration tubes, 250 Storm sewer, 33 "Strength" of sewage, 2, 41 Subsoil, 10 Substratum, 10 Subsurface disposal field, 1 (see also soil absorption system) Surface soil, 10 Tertiary treatment, 3 Tex-A-Robic-contact stabilization package plant, 214 Tex-A-Robic-extended aeration package plant, 212 Textural classification, USDA, 11 Tex-Vit-prefabricated pump stations, 142 TF-2 Tertiary Filters-gravity-type filter backwash, 216 Thiokol-MPB-10-catalytic reactor filter-incinerator, 200 Three-stage RBS-rotating biological surface package plant, 220 Treated wastewater, 276 uses, fertilizer, as, 70 fire protection, for, 75-78 spray irrigation, for, 69-75 Treatment and Disposal Waste Water From Homes, 98 Treatment systems, 33-36 central plants, rural areas, back-up power needed for, 34 failure alarms needed, 34 logs, operation and maintenance, 34 "package" of standard components, 34 tank or basin, size, 34 disinfection, 34 add-on process, 34 design and development needs improvement. 34

#### Index

dispensers should have alarms, 34 effluent, disposal of, 35 general guidelines, 33-34 flooding, 33 self-contained systems, 35 sizing, 35-36 sludge, disposal of, 35 small community, 7-8 activated sludge plants, 7-8 Imhoff tanks, 7 lagoons, 7 physical-chemical plants, 8 trickling filters, 8

Trickling filters, 8

Tulsa Unit-pressurized sewer system, 146

Turboil aerators-floating aerators, 260

Ultra-Dynamics Purifiers — ultra-violet disinfection unit, 274

Ultraviolet radiation, to kill microorganisms, 262

Viruses, 4

Wallax-small chemical precipitation plant, 158

Waste-Tamer-pressure chamber aerated treatment system, 176

Wastewater treatment, historical trends in the availability and quality of, 1-2, Fig. 1

Water, conservation, 294 consumption reduction techniques, 294-295 flow control showers, 294 pressure reducing valve, 294 contaminated, 262 contamination inferred on basis coliform count, 5 recycling of gray for toilet flushing, 99

Water table, 23, 28, 48

Winneberger, 50, 51, 60, 82 most conservative approach, 50-51, 50

Zanoni, 43