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DEVELOPMENT

**IRC
WATER AND SANITATION CENTRE**

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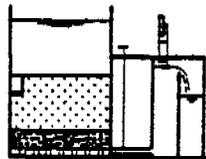
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GUIDELINES FOR
OPERATION AND MAINTENANCE
OF SLOW SAND FILTRATION PLANTS IN
RURAL AREAS OF DEVELOPING COUNTRIES
- TRAINER'S GUIDE -



IRC Research and Demonstration
Project on Slow Sand Filtration

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1. INTRODUCTION

The primary objective of this manual is to provide country organisations responsible for the implementation of Slow Sand Filtration plants (further referred to as SSF plants) for rural communities with a comprehensive set of guidelines which they can use to plan, implement and evaluate local training projects for the caretakers (operators) of the plants.

The manual is intended to serve as a guide for the instructors while they are conducting the training. It is to be used jointly with the manual "Guidelines for operation and maintenance of SSF plants in rural areas of developing countries", which has been prepared to provide the future caretakers with the minimum information needed for their job.

The information contained in each section has been restricted to that which is absolutely essential for successful training of future caretakers of a Slow Sand Filter and a simple distribution system. Wherever possible the vocabulary used has been kept at a very basic level.

Because of the wide variety of circumstances under which it will be used, it will be necessary for those concerned with its application to modify the details to suit local conditions and individual instruction style.

It would be highly appreciated if any suggested major changes in this manual and in the "Guidelines could be reported to the International Reference Centre.

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2. PRINCIPLES OF SYSTEMATIC TRAINING

2.1 INTRODUCTION

When an SSF scheme is installed it is important that it is operated and maintained efficiently. For this, the caretaker of the scheme should have the knowledge, skills and attitudes needed for the proper performance of his job. A new caretaker should not be left to pick up the necessary skills and knowledge by mere exposure to the job. Instead, he should be taught the right way of doing the job from the beginning. Training is the means to achieve this objective in the shortest possible time.

2.2 SYSTEMATIC TRAINING

Effective training should be based upon a systematic procedure because people learn more quickly and easily if they are taught in a systematic way. The training procedure therefore should be based upon the following principles:

Training analysis

Before any training can be planned it is essential to establish exactly what the caretaker must be able to do and what he must know. This can be established by analysing the performance of an experienced operator. The analysis should identify precisely the knowledge, skills and attitudes needed if the job is to be performed efficiently.

Training Analysis should also pinpoint those parts of the job that a trainee will find particularly difficult to master, so that they can be given special attention in the training programme.

Programme planning

An effective training programme requires a definition of when and how the various items will be taught. The information obtained during the training analyses enables one to prepare:

- Instruction plans

A plan for each instruction session indicating how the trainers are to be taught and made to practise each part of the job.

- Timetable

A plan showing when and in what sequence each part of the job should be taught and how much time should be allocated to each part.

Progress recording

In order to control the training programme there should be a clear method for recording the instruction given and the practical exercises carried out. This provides a means for keeping the trainee informed about his progress. It also provides a basis for supervision of what has been taught and what still needs to be taught.

Evaluation and revision

Once a training programme has been started, programme details should be reviewed frequently and modified where necessary. In this way specific local conditions will be incorporated automatically in the programme.

2.3 SELECTION CRITERIA

Qualifications for training

The instructors conducting the training programme should possess a thorough knowledge of, and skills in, the job they are teaching. They also should have the ability to train people together with an understanding of the essentials of systematic training.

Criteria for selecting trainees

It is important that the persons who are selected for training are suited for the job. If not so everyone's confidence in the training programme will be undermined in the long run. Some guidelines for the selection criteria and the selection procedure are shown in Table 1.

Table 1 Guidelines for the selection of trainees

Selection Criteria

- At least primary school;
- Basic knowledge of official and local language(s);
- Not too young (a youth might not be accepted as reliable, or not be respected by the community);
- Preferably previously employed or engaged in a technical job (e.g. mechanic) or in a function in which the applicant showed responsibility (e.g. member of the board of (women's) cooperative, farmer's association or parish council);
- preferably local inhabitant of good standing with a fair guarantee of prolonged residence.

Selection Procedure

- Written baseline test;
 - Interview by committee consisting, for instance, of a representative of planning agency, an instructor at training course and a responsible local representative;
 - Final evaluation by instructor at the end of the training course.
-

3. TRAINING PRACTICE

3.1 TRAINING IMPLICATIONS

It is important for those responsible for the training of caretakers to take into account the following points about how people learn.

Learning takes place through one or more of the five senses.

All new information is received through the five senses of sight, hearing, touch, taste and smell. Sight and hearing are normally the most highly developed senses and most learning derives from what is seen and heard.

Good instruction should appeal to as many of the senses as possible and because about 75% of all new information is absorbed by sight this should be used as much as possible.

Learning is often a Process of Imitation

People in a learning situation are strongly influenced by the example of others. It is, therefore, of the greatest importance that the trainee is given a correct example to follow. Good instruction ensures correct and careful demonstration and protects the learner from exposure to bad examples.

Learning is Reinforced by Practice

The process of acquiring skill in a job cannot be completed without practice. Such practice must be controlled. This means ensuring that what is practised is correct, and that the trainee practising is encouraged by being kept informed of his progress in terms of how well and how fast he is performing.

Learning is a Process of Association

New information is only meaningful if the brain is able to connect it with existing knowledge and experience. Good instruction therefore should take into account what the trainee already knows and is able to do, and this

should be related to any new information. Instruction that goes too far ahead of the learner's knowledge and ability is meaningless and will not be absorbed.

Learning takes place one step at a time

New information is assimilated by the brain in a series of steps rather than continuously and is therefore most effective when information is presented and absorbed in a number of small steps in a logical sequence. Giving too much information at one time is a common instructing fault. Good instruction should be based on a breakdown of the subject matter into learning units of a suitable size.

3.2 TRAINING METHODS

For the training of caretakers of SSF schemes a combination of the following training methods is preferable:

The knowledge lesson

This is used when some knowledge related to a job is to be taught. It normally includes Telling, Illustration, Question and Answer and Discussion. It can be taught in any convenient place and can be used when equipment, materials are not essential or not convenient to use.

When background information is to be taught a talk may be the most convenient means. Most of the time (not more than 30 minutes in each session) is spent in telling, leaving some time at the end for questions. Illustrations should be included in a talk to the maximum extent possible.

The practical lesson

This is used when the instructor wishes to teach a practical activity forming a skill or part of a skill. It includes Telling, Illustration, Demonstration by the Instructor, Question and Answer, Demonstration by the trainee and some Practice.

It is normally taught at the workplace or in a special training area where materials and equipment are available.

Planned experience

Planned experience or practice is the means by which the trainee gradually develops his confidence in doing the job. Most of the practice only can be imparted at a functioning SSF scheme or a demonstration plant. It is necessary to continue the series of practice sessions until the trainee can demonstrate his ability to perform the job or parts of the job to the standard required.

3.3 INSTRUCTION SESSIONS

To assist trainees to learn easily and quickly it is important that the training is organised in such a way that trainees can concentrate on one part of the job at the time.

A useful guide to follow is arranging the teaching of each part of the job in the following sequence.

1. Knowledge
2. Practical Instruction
3. Practice

When dealing with a complex job, it is necessary first to provide the trainee with an outline of the whole job so that he can relate individual instruction sessions on different parts of the whole job.

Instruction plan

A very useful method for the preparation of an instruction session is the drawing of an instruction plan for the session. An instruction plan defines what is to be taught, which instruction method will be used, what training aids are needed and which level has to be reached. The outline of the plan and information which it should contain is given in Table 2.

TABLE 2 Outline of an Instruction Plan

TITLE of session

OBJECTIVE of session - A precise statement of what the trainees have to learn.

EQUIPMENT NEEDED - A list of tools, equipment, visual aids, reference sources, protective clothing, etc.

TRAINING METHOD - Talk, knowledge lesson, practical lesson, practice.

TIME - An estimate of how long the session will take.

INTRODUCTION - An explanation about why the session is important, objective, method and its relationship with previous sessions.

DEVELOPMENT - A breakdown of the main points that the instructor is going to cover.

SUMMARY - A statement of the main points that have been covered.

TEST - A check that the trainees have acquired the knowledge or skill taught during the session.

REVIEW - Comparison of test results with the objective in order to establish progress of the trainees.

3.4 TIMETABLE FOR TRAINING

A timetable is basically a chart showing the sequence in which the knowledge and operation skills should be taught and when practice sessions should take place.

When preparing a timetable the following key principles should be taken into account:

- First, trainees need to be given a broad picture of the overall process so that they can relate the more detailed instruction sessions which follow to the whole process and see where they fit in;
- Only a limited amount of new information and/or skill should be introduced in any one day and/or one week. Especially in the first sessions the information should be limited as the trainees have to get used to the training procedure;

- The basic sequence that should be followed for each operation skill is knowledge followed by practical instruction followed by practice.

Care should be taken to ensure that the timetable is used as a guide which is varied according to the progress and abilities of the trainees. It should never be used as a rigid plan. Besides, it is not possible to lay down a very precise timetable as it will be necessary to attune it to occasional events such as cleaning of a filter. An example of a timetable is shown in Figure 1.

Figure 1. Example of a time table.

Content	Week of training				
	1	2	3	4	
Water supply from source to distribution	x				
Community Participation	x				
Sanitation	x				
Water Intake		x			
The slow sand filter		x			
The filtration process		x			
Instruction on operation jobs		x			
Cleaning of raw water intake and raw water pump		x			
Starting up a new filter				x	
Operation procedure and daily adjustments			x		

3.5 TRAINING RECORDS AND REPORTS

A system of records and reports is essential for the success of any training programme, and those which are compiled during the first few courses are of particular value because it is from information recorded that ideas for improvements to subsequent courses are derived.

Records and reports should be kept for the following reasons:

- To provide information on the progress of training for each trainee in terms of instruction received and practice successfully completed.
- To provide a means which can be used to keep trainees informed about their progress.
- To coordinate all the information about the training given and the ability of the trainees. This can be used to determine which parts of the job the trainee is most suited for by interest and ability and how much supervision the trainee is likely to need during and after training.
- To ensure continuity and consistence in training programmes and to provide a measure of the effectiveness of the training provided.

A training report is essentially an assessment of a trainee's ability by an instructor and/or a supervisor. The main difficulty with assessments is the maintenance of consistent reporting standards. For this reason it is essential that instructors and supervisors making reports adhere to common definitions.

Table 3 should be used when compiling the training records. Records and reports should be kept simple, practical and require a minimum effort in administration. For these reasons the combined records and reports shown in Annex 1 are recommended. They can easily be adapted to suit local requirements providing the essential information is not neglected.

Table 3 Definitions of evaluating the trainees abilities

ITEM	GOOD	SATISFACTORY	POOR
Knowledge	Easily grasps new information and is quick to learn.	Receptive but does not always grasp new information quickly.	Unreceptive-slow to grasp and understand new information.
Practical Work (operation skills)	Works competently and accurately and is able to deal with most problems that arise.	Works competently, usually produces work of a good quality.	Works slowly and is liable to make mistakes.
Planned Experience	Able to operate and maintain filtration scheme without supervision.	Able to operate and maintain filtration scheme with limited supervision.	Only able to carry out a limited range of activities.

4 SYLLABUS

Once a thorough analysis has been made of the process that is to be taught, the syllabus for the training course can be identified. It should indicate what has to be covered by a local caretaker of an SSF plant. This syllabus may be as indicated below.

The content of the syllabus is based on the information which is given in the manual "Basic guidelines for operation and maintenance of SSF plants in rural areas of developing countries." As the specific job requirements might vary in the different countries, it is advisable to adapt the contents of this syllabus to the local circumstances before starting the training course.

TECHNICAL BACKGROUND KNOWLEDGE

1. Village water supply

The main objectives of village water supply, the sources which are available and a general understanding of the hydrological cycle.

2. Water supply system from source to distribution.

The various stages of the water supply and the general functioning of those.

3. Community participation.

Considerations of the need for community participation, the interaction between the caretaker and the community and items for regulations in a village water supply scheme.

4. Sanitation.

Need for sanitation, the diseases related to water, the methods of preventing pollution and the construction of a latrine.

5. Water intake and pre-treatment.

Purpose and functioning of water intake and some pre-treatment methods.

6. The slow sand filter.

The basic elements of a slow sand filter.

7. The filtration process and flow regulation.

The process of biological filtration, the meaning of head loss, the way in which rate of filtration can be regulated and the method of declining rate filtration.

8. Clear water storage and chlorination.

The reasons for and method of chlorination and the purpose of clear water storage.

9. Water transport and distribution.

The pumps which are needed, maintenance of these pumps, the reason for an elevated distribution reservoir, and the construction, operation and maintenance of the distribution system.

10. Control devices.

The tests and records to be made for normal operation and maintenance.

JOB ANALYSIS

1. Cleaning of raw water intake and raw water pump.

2. Starting-up a new filter.

3. Operation procedure and daily adjustments.

Normal operation and declining rate filtration.

4. Shutting down procedure.

5. Cleaning a filter bed.

6. Resanding a filter.

7. Sand washing by hose.

Sand washing and check to see if the sand is clean.

8. Sampling procedures.

Sampling procedures and test for chlorine residual and turbidity.

9. Chlorination.

Storage, mixing and supplying of chlorine.

10. Plant records.

Operation diary and cleaning report.

5. INSTRUCTION PLANS ON BACKGROUND KNOWLEDGE

This section contains the instruction plans on the background knowledge which the trainee should obtain. The instruction plans are based on the information provided in the manual Guidelines for operation and maintenance of slow sand filtration plants in rural areas of developing countries.

Each plan contains a detailed procedure for the conduct of the sessions including the method of assessment to be used to establish if the trainee has assimilated what he has been taught.

The procedure suggested in each plant is designed to use the principles of systematic training referred to in this manual. It should not be regarded as rigid, but should be used as a guide for the instructor when adapting it to suit his own style of presentation.

Before starting the instruction, the intentions of the training and an outline of the course have to be explained to the trainers. A timetable can be given to them and training procedures should be explained as well. At this stage it is important to tell that as a means of helping the trainees to learn, tests will be incorporated in almost every training session.

5.1 VILLAGE WATER SUPPLY

<u>OBJECTIVE</u>	Trainees will be able to describe in their own words: <ul style="list-style-type: none">- The main objective of village water supply- The sources of water supply- The hydrological cycle
<u>EQUIPMENT</u>	Paper, blackboard It could be helpful for the explanation of the hydrological cycle to arrange for a small container filled with water, even a cup might do, and covered with a clear plastic sheet (plastic bag). When the container is put in the sun, part of the water will evaporate and condense on the plastic sheet since this will be cooler. So the formation of raindrops can be made visible.
<u>METHOD OF INSTRUCTION</u>	Talk and discussion with questions and answers. Demonstration of formation of raindrops.
<u>TIME</u>	Two hours.
<u>INTRODUCTION</u>	State title of session and objective. Explain the method of instruction.
<u>DEVELOPMENT</u>	<ol style="list-style-type: none">1 Prepare the demonstration of condensation;2 Draw an outline of the hydrological cycle and discuss it. Check by questions that the trainees have understood what they have been told.3 Describe the various water sources.4 Discuss preference of water sources.
<u>SUMMARY AND TEST</u>	Write the water sources on the blackboard and select the preference by questioning the trainees.
<u>REVIEW</u>	Review any part about which the trainee appeared unsure.

5.2 THE WATER SUPPLY SYSTEM FROM SOURCE TO DISTRIBUTION

<u>OBJECTIVE</u>	Trainees will be able to describe in their own words the stages of the system and answer questions about general aspects. Trainees will be given a copy of a diagram without written information to assist them.
<u>EQUIPMENT</u>	Blackboard, paper Profile of a treatment plant (Fig. 13 of the manual) without written information).
<u>METHOD OF INSTRUCTION</u>	Talk and discussions with questions and answers.
<u>TIME</u>	Two hours.
<u>INTRODUCTION</u>	State title of session, explain that trainees need to know the overall system so that they can follow where each instruction session fits in with the whole and that they can explain the system to others. State the objectives of the session. Explain method of instruction.
<u>DEVELOPMENT</u>	1 Build up the profile stage by stage and explain the main points. 2 Before proceeding to the next stage check by questions and answers that the trainees have understood what they have been told. 3 Ask for general questions from trainees
<u>SUMMARY</u>	Build up a new profile by asking trainees questions and recording their answers.
<u>TEST</u>	Give the trainees a plain profile and ask them the name of each stage, and the main purposes.
<u>REVIEW</u>	Review any part about which the trainee was unsure.

5.3 COMMUNITY PARTICIPATION

<u>OBJECTIVE</u>	Trainees will be able to describe in their own words: <ul style="list-style-type: none">- The considerations of the need for community participation;- The interactions between the caretaker and the community;- The items for regulations in village water supply schemes.
<u>EQUIPMENT</u>	Blackboard, paper; Scheme of interaction (fig. 8 of the manual without information written on it).
<u>METHOD OF INSTRUCTION</u>	Talk and discussions with questions and answers. Role playing in which the trainees will portray the various groups in the community. This gives the trainees the opportunity to learn from experience the positive function which the caretaker can have in the village and the possible reactions of the community members.
<u>TIME</u>	Preferably 2 x 3 hours.
<u>INTRODUCTION</u>	State title of the session. State the objective. Explain the basic idea of role playing.
<u>DEVELOPMENT</u>	<ol style="list-style-type: none">1 Give a description of community participation in relation to the essential elements of a successful water supply system.2 Show the stages and the way in which the community should be involved.3 Discuss the position of the caretaker by following figure 8 from the manual.4 Discuss the items that could be included in the regulations of the the village water supply.5 Ask for general questions.6 Start a role play.7 Evaluate the role play.
<u>SUMMARY AND TEST</u>	Build up by questioning the trainees: A list of the essential elements of a successful water supply A scheme of the ineration between caretaker and community A set of regulations
<u>REVIEW</u>	Review any parts about which the trainee appeared unsure during the test.

5.4 SANITATION

OBJECTIVE

Trainees will be able to describe:

- The need for sanitation
- The 4 categories of diseases related to water
- The main methods of preventing pollution

EQUIPMENT

Blackboard, paper

If available a microscope to give the trainees an idea of bacteria

METHOD OF INSTRUCTION

Talk and discussions with questions and answers

Demonstration with a microscope

TIME

Two hours

INTRODUCTION

State title of the session and explain the necessity of a basic knowledge in sanitation which enables the trainees to collaborate with a village health worker.

State the objective.

Explain the method of instruction.

DEVELOPMENT

1 Explain the need for sanitation

2 Discuss the categories of disease related to water

3 Demonstrate the aquatic life in various types of water with a microscope. Explain the enlargement factor of the microscope with an example e.g. point of a pin and a football.

4 Explain the methods of preventing pollution.

5 Discuss the construction of a latrine.

SUMMARY AND TEST

State the categories of diseases related to water and the methods of preventing pollution on the blackboard by questioning the trainees.

Make a design of a latrine and question which local materials could be used for construction.

REVIEW

Review any parts about which trainees appeared unsure during the session.

5.5 WATER INTAKE AND PRE-TREATMENT

<u>OBJECTIVE</u>	Trainees will be able to describe in their own words the name and purpose of the water intake and some pre-treatment methods.
<u>EQUIPMENT</u>	Blackboard, paper.
<u>METHOD OF INSTRUCTION</u>	Talk and discussions with questions and answers.
<u>TIME</u>	Two hours
<u>INTRODUCTION</u>	State title of session, explain that trainees need to know about the water intake and some pre-treatment methods and considerations because usually without pre-treatment frequent cleaning of the filters would be necessary. State the objective. Explain the method of instruction.
<u>DEVELOPMENT</u>	<ol style="list-style-type: none">1 Recapitulate the various stages in a water supply system.2 Sketch some intake structures on the blackboard.3 Describe the raw water intake structure, its function and the need for cleaning.4 Build up a list of the pre-treatment operations and remove from the sight of the trainees.5 Repeat the list by explaining the method and considerations for each operation in turn, using the appropriate figure as a visual support for the explanation.6 Check by means of questions and answers that the trainees have understood what they have been told before proceeding to the next stage.7 Ask for general questions from trainees.
<u>SUMMARY</u>	Build up a list of the operations and important characteristics by asking trainees questions and recording their answers.
<u>TEST</u>	Give the trainees the appropriate figures and ask them to answer the following questions. <u>Water intake</u> <ul style="list-style-type: none">- Why is it necessary to provide screens at the intake?- What happens when material collects on the screen?- Is the water intake sometimes interrupted? <u>Storage Reservoirs</u> <ul style="list-style-type: none">- Why is storage needed?- What happens to the suspended matter in the water?- What are the three characteristics of the water which are reduced by storage of the water?

River-bed filtration

- Does the silt stay in the river-bed?

Sedimentation

- What governs the amount of sediment carried by water in the intake channel?
- How often should the tank be cleaned?

Horizontal flow pre-filtration

- Name the main benefit of horizontal pre-filtration.

Aeration

- What are two symptoms of lack of oxygen in water?
- How does the water collect oxygen in the aeration system.

REVIEW

Review any parts about which trainees appeared unsure during the test.

5.6 THE SLOW SAND FILTER

<u>OBJECTIVE</u>	Trainees will be able to describe in their own words the essential elements of a slow sand filter. They will be provided with a diagram without written information to assist them.
<u>EQUIPMENT</u>	Blackboard, paper Figure of a slow sand filter without written information.
<u>METHOD OF INSTRUCTION</u>	Talk and discussions with questions and answers.
<u>TIME</u>	One and a half hours.
<u>INTRODUCTION</u>	State title of session, explain that trainees need to know the essential elements of the filter so that they can understand why and how they have to take care of the filter.
<u>DEVELOPMENT</u>	<ol style="list-style-type: none">1 Build up the figure stage by stage and explain the main points.2 Before proceeding to the next stage check by questions and answers that the trainees have understood what they have been told.3 Ask for general questions from trainees.
<u>SUMMARY</u>	Build up a new figure by asking trainees questions and recording their answers.
<u>TEST</u>	<ol style="list-style-type: none">1 Give the trainees a plain diagram and ask them to explain each stage, what happens and why.2 Ask them the following questions:<ul style="list-style-type: none">- What is the thicknes of the sand layer?- What is the height of the supernatant water
<u>REVIEW</u>	Review any parts about which the trainees were unsure.

5.7 THE FILTRATION PROCESS AND FLOW REGULATION

<u>OBJECTIVE</u>	Trainees will be able to describe in their own words: <ul style="list-style-type: none">- What happens as the water flows through the filter.- How the flow can be regulated and why this is necessary.- What is meant by declining rate filtration.
<u>EQUIPMENT</u>	Blackboard, paper Figure of a slow sand filter without written information and a blackboard.
<u>METHOD OF INSTRUCTION</u>	Talk and discussion
<u>TIME</u>	One and a half hours
<u>INTRODUCTION</u>	State title of session, explain that it is necessary to know what happens as the water passes through the filter and to understand the design and the operations which are needed to ensure a proper functioning of the plant.
<u>DEVELOPMENT</u>	<ol style="list-style-type: none">1 Discuss the mechanism of biological filtration and point out the need for flow control.2 Build up the figure of the slow sand filter with the main regulation valves.3 Explain the meaning of head loss and make sure they understand.4 Explain the principle of flow regulation.5 Point out that if operation at constant rate is not possible, declining rate filtration may be used.
<u>SUMMARY</u>	Build up a new figure by asking trainees questions and recording their answers.
<u>TEST</u>	<ol style="list-style-type: none">1 Give the trainees a plain diagram, or a plain paper and ask them to explain the operation of the valves.2 Ask them to explain in their own words:<ul style="list-style-type: none">- What is meant by head loss.- Why a weir is built in the filtered water chamber.- Why the rate of filtration gradually reduces if the valve in the filtered water channel is not further opened.- How the rate of filtration can be checked and what rate they would expect if the filter is working satisfactorily.- How they can prevent the filter working at an excessive rate?
<u>REVIEW</u>	Review any points about which the trainees appeared unsure during the test.

5.8 CLEAR WATER STORAGE AND CHLORINATION

<u>OBJECTIVE</u>	Trainees will be able to describe in their own words: <ul style="list-style-type: none">- The reasons for and the method of chlorination.- The purposes of the clear water tank.
<u>EQUIPMENT</u>	Paper, blackboard, a figure of a drip chlorinator and the visual aid attached to this instruction plan.
<u>METHOD OF INSTRUCTION</u>	Talk and discussions with questions and answers.
<u>TIME</u>	One hour.
<u>INTRODUCTION</u>	State the title of session, explain that trainees need to know the purpose of chlorination and clear water storage because of the importance of a safe and continuous supply of water to consumers. State the objectives and explain the method of instruction.
<u>DEVELOPMENT</u>	<ol style="list-style-type: none">1 Build up the visual aid step-by-step; explain the main points stated in the notes. Before proceeding to the next stage check by questions and answers that the trainees have understood what they have been told.2 Explain the functioning of a drip chlorinator.3 Ask for general questions from trainees.
<u>SUMMARY AND TEST</u>	Build up the visual aid by asking the trainees to answer in their own words the following questions. If they cannot give the correct answer review the points in question. <u>Chlorination</u> <ul style="list-style-type: none">- What are the two main reasons for chlorination?- Why must the concentration of chlorination be carefully controlled? <u>Clear water tank</u> <ul style="list-style-type: none">- What are the two main purposes of the tank? What are the three main design features of the tank?- When the aid has been rebuilt briefly summarise the main points.
<u>REVIEW</u>	Review any points about which the trainees appeared unsure during the test.

VISUAL AID: CHLORINATION AND CLEAR WATER STORAGE.

CHLORINATION

Reasons

- Protection against defects in filter;
- Prevention aftergrowth in distribution system.

Control

Too little = insufficient disinfection

Too much = objectionable taste

Gross excess = danger to health

PURPOSES OF CLEAR WATER TANK

- Evens out output variations
- Applications of chlorine

DESIGN FEATURES OF THE TANK

- Adequate capacity for 30 to 60 minutes contact time for chlorine
 - Baffles to prevent stagnation
-

5.9 WATER TRANSPORT AND DISTRIBUTION

OBJECTIVE

Trainees will be able to describe in their own words:

- The pumps which usually are necessary;
- Important considerations about operation and maintenance of these pumps;
- The reason for elevated distribution reservoir;
- The main points about operation and maintenance of the distribution system.

EQUIPMENT

Blackboard, paper and the visual aid attached to this instruction plan

METHOD OF INSTRUCTION

Talk and discussions with questions and answers.

TIME

One and a half hours.

INTRODUCTION

State the title of the session, explain that trainees need to know about the important considerations concerning pumping and distribution because if they are not properly looked after the consumers will be deprived of the benefits of a filtered supply of water. State the objective and explain the method of instruction.

DEVELOPMENT

- 1 Split the session into three parts:
 - Pumps
 - Elevated distribution reservoir
 - Operation and maintenance of the distribution system. For each part, build up the visual aid, explaining each of the headings displayed using the notes provided.
- 2 Before proceeding to the next part, check by questions and answers that the trainees have understood what they have been told.
- 3 Ask for general questions from trainees.

SUMMARY AND TEST

Build up the visual aid by asking trainees to answer in their own words the following questions. If they cannot give the correct answer, review the point in question.

Pumps

- What must be done to ensure trouble free running?

Elevated distribution reservoir

- What are the three main reasons for using an elevated distribution reservoir?

Distribution system operation and maintenance

- Why is it important to have accurate and up to date plans of the distribution system?
- What information should be shown on the plans?
- Name the three main problems that can be caused by an intermittent supply.
- Why is it important to drain spillage and promptly repair damaged fittings at standposts?

When the aid has been rebuilt briefly summarise the main points.

REVIEW

Review any points about which the trainees appeared unsure during the test.

VISUAL AID: WATER TRANSPORT AND DISTRIBUTION

PUMPS

- Regular maintenance
- Clean surroundings
- Never run it without water

REASONS FOR ELEVATED DISTRIBUTION RESERVOIRS

- Demand variation can be met with constant pump rate
- Adequate and uniform pressure
- Supply maintained during short breakdowns or pump changeover

DISTRIBUTION SYSTEM OPERATION AND MAINTENANCE

- Plans showing position of pipes, valves, hydrants, fittings.
 - Inspection for leakage.
 - Prevent intermittent supply because of pollution and air locks.
 - Central collection points:
drainage of spillage, prompt repairs, kept clean.
-

5.10 CONTROL DEVICES

OBJECTIVES

Trainees will be able to state:

- The tests that must be made, how often and at which stage of treatment they must be made.
- The basic records that should be kept and the reason why.

EQUIPMENT

Blackboard, paper
Scheme of a water treatment plant.
Visual aid attached to this instruction plan.

METHOD OF INSTRUCTION

Talk and discussions with questions and answers.

TIME(including test)

One and a half hours.

INTRODUCTION

State the title of the session and explain that trainees need to know about the control of quality because it is their prime duty to ensure a safe supply of water free from dangers to health to their consumers.
At this point it will be useful to make a list of local water borne diseases.
Explain the need for and the advantages of regular records.
State the objectives and explain the method of instruction.

DEVELOPMENT

- 1 Underline that it is the prime duty of the caretaker to ensure a safe supply of water free from dangers to health and explain the guidelines laid down by the World Health Organization.
- 2 Build up the visual aid showing:
 - The tests that must be done, explaining what each test is for, with a simple explanation of how it is made.
 - The stage where the tests must be taken, using the scheme of a plant.
- 3 Explain the important aspects of sampling.
- 4 Explain the necessity for and the advantages of regular records.
- 5 Show the precautions that must be taken by the caretaker to maintain a safe supply of water at the filter explaining the importance of each.
- 6 Before proceeding to the next stage check by questions and answers that the trainees have understood what they have been told.
- 7 Ask for general questions from trainees.

SUMMARY AND TEST

Repeat each of the development stages by building up the visual aid used by asking the trainees questions and recording their answers.

Give the trainees a copy of the scheme of a treatment plant and ask them:

To write down or state which tests have to be carried out at which stages and how often.

What are the precautions that must be taken to maintain a safe supply of water.

Why are regular records important.

Which records must be kept.

REVIEW

Review any points about which the trainees appeared unsure.

VISUAL AID CONTROL DEVICES

TESTS

- Chlorine residual
- Turbidity

Precautions to be observed by caretaker

- 1 Daily check intake for pollution and blockage
- 2 Prohibit contamination near intake
- 3 Control the rate of filtration
- 4 Check the chlorine residual
- 5 Check turbidity
- 6 Keep the necessary records
- 7 Communicate with the villagers on the water supply, health and sanitation
- 8 Check the distribution system and especially the standposts

Plant records

- Performance of the plant
 - Show problems that need attention
 - Help to forestall problems
-

6. INSTRUCTION PLANS ON OPERATION JOBS

This section contains the instruction plans for the practical sessions.

Each plan contains a detailed procedure for the conduct of the sessions including the method of assesment to be used to establish if the trainee has assimilated what he has been taught.

The procedure suggested in each plant is designed to use the principles of systematic training referred to in this manual. It should not be regarded as rigid, but should be used as a guide for the instructor when adapting it to suit his own style of presentation.

In the first session it should be explained that because the demonstration of most of the job will take considerable time, the instruction content usually will be fragmented and that each piece of instruction will show the following pattern.

1. Demonstration by the instructor.
2. Questions from trainees to clear up doubts or misconceptions.
3. Demonstration by trainees

Explain as well that whenever a trainee makes a mistake it will be corrected immediately to prevent the trainees from learning wrong methods.

6.1 CLEANING OF RAW WATER INTAKE AND PUMP

<u>OBJECTIVE</u>	Trainees will be able to maintain the raw water inlet and the raw water pump.
<u>EQUIPMENT</u>	Raw water inlet structure Raw water pump
<u>METHOD OF INSTRUCTION</u>	Demonstration on site
<u>INTRODUCTION</u>	Explain the need for a free water inflow and a regular maintenance of the pump. State the objective of the session and explain the method of instruction.
<u>DEVELOPMENT</u>	Use the job analysis as a demonstration plan. <ol style="list-style-type: none">1. Explain the need for regular cleaning of the screen and demonstrate how it should be done.2. Show the raw water inlet valve and explain that intermittent intake of water may be needed.3. Demonstrate the way in which the depth of and the water level in the pump sump should be measured and explain the reason for it.4. Point out that pump failure is reported to be the most frequent reason for breakdowns in water supply systems in developing countries. Explain that regular maintenance is essential to prevent pump failures.5. Show how the pumps should be checked and kept clean.6. Ask the trainees if they have any questions.
<u>PLANNED EXPERIENCE</u>	Arrange for the trainees: <ul style="list-style-type: none">- To carry out a cleaning of the raw water intake screen.- To measure the water level and the depth of the pump sump.- To demonstrate the regular pump maintenance.

6.2 STARTING-UP A NEW FILTER

<u>OBJECTIVE</u>	Trainees will be able to start-up a filter
<u>EQUIPMENT</u>	Slow sand filter complete with clean sand properly leveled.
<u>METHOD OF INSTRUCTION</u>	Demonstration on site.
<u>INTRODUCTION</u>	<p>Explain that correct and careful starting-up of a filter is very important to ensure that the filter is working effectively and that it is producing a safe supply of water.</p> <p>State the objective of the session and emphasis that the trainees should be able to commission the filter under supervision next time.</p>
<u>DEVELOPMENT:</u>	<p>Use the job analysis as a demonstration plan for each stage emphasising the key actions.</p> <ol style="list-style-type: none">1. Discuss the cleaning of the filter-box and the way in which the check for water tightness can be made.2. Explain the way in which the filter is filled with sand and that the sand should be as clean as possible.3. Demonstrate each of the following key actions.<ul style="list-style-type: none">- Undercharge with water- Removal of floating impurities- Smoothing of the sand surface- Charging of the filter; explain the reason of a low initial filtration rate- Passing filtered water into supplyDemonstrate each key action by actually operating valves and equipment, explaining what is being done and why it is being done. <p>Ask the trainees if they have any questions. Ask the trainees to perform the stage by first explaining what they are going to do and then doing it.</p> <p>Correct any mistakes immediately they arise.</p> <p>When the trainees have completed the stage ask them to explain what they have done and why.</p>
<u>PLANNED EXPERIENCE:</u>	Inform the trainees that they will be asked to commission a filter twice under close supervision followed by a third time when they will be asked to do it on their own with the supervisor completing an evaluation record to make sure that they are competent to work on their own. These will be arranged as and when the opportunity arises.

6.3 OPERATING PROCEDURE AND DAILY ADJUSTMENT

OBJECTIVE

Trainees will be able to operate a slow sand filter in the normal situation and also by means of declining rate filtration.

EQUIPMENT

Slow sand filter under normal operation

METHOD OF INSTRUCTION

Demonstration on site

INTRODUCTION

Explain the importance of the filter skin (schmutzdecke) to the process and the need to avoid sudden changes in the equilibrium of the bed for which a constant rate of filtration should be kept.

State the objective of the session and explain the pattern of instruction.

DEVELOPMENT

Use the job analysis as a demonstration plan for the session, emphasising key actions.

Demonstrate how to:

1. Measure the rate of filtration
2. Decide how many turns are needed on the filtration water valve
3. Obtain the desired rate

Ask the trainees if they have any questions.

As the trainees to actually perform the procedure by first explaining what they are going to do and why.

Correct any mistakes the moment they arise.

Discuss the way in which declining rate filtration may be applied, why it is needed and how it is done.

PLANNED EXPERIENCE

Arrange for the trainees to carry out the normal operation procedure under supervision a number of times and when they are ready ask them to do a check on their own with the Supervisor completing the evaluation record.

Discuss the results of the record with the trainees afterwards.

6.4 SHUTTING DOWN PROCEDURE

<u>OBJECTIVE</u>	Trainees will be able to shut down a filter
<u>EQUIPMENT</u>	Slow sand filter ready for cleaning
<u>METHOD OF INSTRUCTION</u>	Demonstration on site
<u>INTRODUCTION</u>	<p>Explain the conditions which indicate that a filter is ready for cleaning.</p> <p>State the objective of the session and emphasise that trainees should be able to shut down a filter under supervision next time.</p> <p>Explain the pattern of instruction.</p>
<u>DEVELOPMENT</u>	<p>Use the job analysis as a demonstration plan for each stage emphasising the reasons for each stage and the key actions.</p> <p>Demonstrate how to:</p> <ul style="list-style-type: none">- Remove floating matter- Drain the top water- Drain the upper part of the sand bed- Maintain the output of the plant <p>After each demonstration:</p> <p>Ask the trainees if they have any questions.</p> <p>Ask the trainees to actually perform the stage by first explaining what they are going to do and then doing it.</p> <p>Correct any mistakes immediately when they arise.</p> <p>When the trainees has completed the stage ask them to explain what they have done and why.</p> <p>Correct any misunderstanding.</p>
<u>PLANNED EXPERIENCE</u>	Inform the trainees that they will be asked to shut down a filter twice under close supervision followed by a third time when they will be asked to do it on their own with the supervisor completing an evaluation record to make sure that they are competent to work on their own. These will be arranged as and when the opportunity arises.

6.5 CLEANING A FILTER BED

<u>OBJECTIVE</u>	Trainees will be able to prepare a filter for cleaning, clean the bed, and to prepare the bed
<u>EQUIPMENT</u>	Slow sand filter ready for cleaning
<u>METHOD OF INSTRUCTION</u>	Demonstration on site
<u>TIME</u>	
<u>INTRODUCTION</u>	<p>Explain that it is important to do a thorough job of cleaning, to do it as quickly as possible and to avoid or prevent contamination during the cleaning process.</p> <p>State the objective of the session and emphasize that trainees should be able to clean a filter under supervision next time.</p> <p>Explain the pattern of instruction.</p>
<u>DEVELOPMENT</u>	<p>Use the job analysis as a demonstration plan for each stage of the cleaning operation. If the trainees make mistakes correct them immediately.</p> <ol style="list-style-type: none">1. Preparation Show the trainees how to check that the bed is ready for cleaning followed by a demonstration of how to scrub the walls.2. Clean walls Ask the trainees to scrub the walls.3. Assemble Equipment Ask the trainees to assemble the equipment, show them how to scrape an area for placing the equipment and ask them to complete scraping the area.4. Mark out the bed. Show the trainees how to mark out and scrape the bed and ask them to complete the marking out and scraping the area.5. Remove scrapings Show the trainees how to erect a ramp and boards for removal of the scrapings and ask them to complete the task of removing all the scrapings.

6. Prepare for re-charging
Show the trainees how to prepare the bed for re-charging and ask them to complete the preparation of the bed.
7. Maintenance of the bed
Show with explanation the trainee(s) how to examine the bed and equipment for defects, and ask them to demonstrate each examination in turn.

SUMMARY

When the operation is complete conduct a question and answer discussion with the trainees to clear up doubts and misunderstandings and to make sure they have understood all the key points associated with each stage.

PLANNED EXPERIENCE:

Inform the trainees that they will be asked to clean a filter twice under close supervision followed by a third time when they will be asked to do it on their own. The supervisor will then complete an evaluation record to make sure they are competent to work independently. These cleanings will be arranged as and when the opportunity arises.

6.6 RESANDING A FILTER

OBJECTIVE

Trainees will be able to decide when resanding is necessary and to resand the filter bed.

EQUIPMENT

Slow sand filter ready for resanding

INTRODUCTION

Explain the conditions under which resanding becomes necessary and why, and how to decide when it is necessary.

Explain the activities for resanding.

State the objectives of the session and emphasize that trainees should be able to resand a filter bed under supervision next time.

Explain that the trainees have already been instructed in the jobs preceding the resanding of a filter. Briefly state the key actions for lowering the water level and scraping of the filter-bed.

DEVELOPMENT

Use the job analysis as a demonstration plan for each stage emphasising the key actions. Any mistakes made by the trainees should be corrected at once.

1. Scrape the filter.

Review the procedure for scraping the filter and ask the trainees to do this task.

2. Lower water level and resand

Ask the trainees to lower the water level and then demonstrate how to remove the old sand and to refill with new sand.

Ask the trainees if they have any questions.

Ask them to complete the resanding process.

3. Prepare the bed for re-charging

Revise the procedure for re-charging and ask the trainees to do this task.

PLANNED EXPERIENCE:

Inform the trainees that they will be asked to resand a filter bed once under supervision followed by a second time when they will be asked to do it on their own. The supervisor will then complete an evaluation record to make sure they are competent to work independently.

The resanding will be arranged as and when the opportunity arises.

6.7 SANDWASHING BY HOSE

OBJECTIVE

Trainees will be able to remove impurities from sand, check quality of washed sand and dry and store washed sand.

EQUIPMENT

Washing platform, hose, supply of water and storage for the clean sand.

METHOD OF INSTRUCTION

Demonstration on site

INTRODUCTION

Explain why sand washing is carried out and when it should be done.

Explain the activities for sandwashing.

State the objectives of the session and emphasise that trainees should be able to wash the sand under supervision next time.

Explain the pattern of instruction. Any mistakes of the trainees must be corrected immediately.

DEVELOPMENT

Use the job analysis as a demonstration plan for each stage emphasising the key actions.

1. Loading of the platform
Demonstrate how to load the platform explaining the reasons for doing it that way. Ask for questions and then ask trainees to complete the loading of the platform.
2. Washing the sand and quality check
Demonstrate how to wash the sand and check the quality. Explain why it is done that way and what precautions to observe. Ask for questions from trainees and then ask them to complete the washing, including the quality check.
3. Discuss the need to rewash before using during resanding the filter bed.
4. Drying and storing the sand
Demonstrate how to dry and store the washed sand. Ask for questions and then ask the trainees to complete the tasks.
5. Cleaning washing equipment
Explain the importance of cleaning the equipment used and then supervise the trainees cleaning the equipment.

PLANNED EXPERIENCE

Inform the trainees that they will be asked to demonstrate their ability to carry out the sand washing process when the next opportunity occurs. The supervisor will complete an evaluation record to make sure that the trainees are competent to work independently .

6.8 SAMPLING PROCEDURES

OBJECTIVE

Trainees will be able to take:

- A turbidity sample and compare with a prepared standard
- A chlorine residual sample and compare with a standard colour

EQUIPMENT

- Sample bottle
- Turbidity standard
- Chlorine reagent and set of standard colours

METHOD OF INSTRUCTION

Demonstration on site

INTRODUCTION:

Explain the importance of samples and measurements and stress the need for a strict adherence to the methods that will be demonstrated during the session.

State the objectives of the session and emphasize that trainees will be able to take samples under supervision next time.

Explain that the session will be divided into the following three parts.

- Turbidity measurement
- Chlorine Residual measurement
- Bacteriological samples

DEVELOPMENT

Use the job analysis as a demonstration plan for each stage emphasising key points.

1. Turbidity Measurement

Demonstrate how to take a turbidity sample, how to compare with a prepared standard and how to interpret the comparison.

Ask the trainees if they have any questions.

Ask the trainees to take a sample, make and interpret the comparison by first explaining what they are going to do and then doing it.

Correct any mistakes immediately they arise.

When the trainees have completed the stage ask them to explain what they have done and why. Correct any misunderstanding.

4. Chlorine Residual Measurement

Demonstrate how to take a sample, add a reagent compare with a standard colour set and interpret the comparison.

Ask the trainees if they have any questions.

Ask the trainees to make a sample, add the reagent compare and interpret with the standard, by first explaining what they are going to do and then doing it.

Correct any mistakes immediately they arise.

When the trainees have completed the stage ask them to explain what they have done and why.

Correct any misunderstanding.

3. Bacteriological Samples

Discuss the need for these samples and the way they have to be done. Unless the caretaker will be in charge of sampling as well it is not necessary to demonstrate.

SUMMARY

Re-emphasise the importance of samples and the need for strict adherence to the procedure they have been shown.

PLANNED EXPERIENCE

Inform the trainees that they will be asked to take samples under close supervision a number of times and that when their Supervisor decides they are ready that he will complete an evaluation record to make sure that they are competent to work independently.

6.9 CHLORINATION

OBJECTIVE

Trainees will be able to chlorinate the water in a safe way.

EQUIPMENT

Drip chlorinator
Storage equipment for chlorine
Measuring devices
Chlorine test kit

METHOD OF INSTRUCTION

Demonstration on site

INTRODUCTION

Explain the reason for chlorination and the need for a strict adherence to the methods that will be demonstrated.
Explain that chlorine is not harmless and very aggressive.

DEVELOPMENT

1. Explain the need for good storage of the chlorine.
2. Prepare a chlorine solution.
3. Fill the drip chlorinator.
4. Regulate the outflow of the chlorinator on the basis of the chlorine residual content.
5. Ask the trainees for questions and let them repeat step 1-4.

SUMMARY

Review the reason for chlorination and the need for careful operation and good storage.

PLANNED EXPERIENCE

Inform the trainees that they will be asked to repeat the procedure given in this session, several times under supervision and that the supervisor will complete an evaluation record.

6.10 PLANT RECORDS

OBJECTIVE

Trainees will be able to complete and maintain:

- An operation diary
- A cleaning report

EQUIPMENT

Samples of the operation diary sheet and cleaning report in use
Examples of information to enter into a diary sheet and cleaning report
Example of a completed diary sheet and cleaning report

METHOD OF INSTRUCTION

Demonstration and Practice

TIME

Three hours

INTRODUCTION

Explain that records are important in order for the caretaker and his superiors to assess the efficiency of the filter by reference to factual information about:

- How the filter is performing
- Problems that need immediate attention
- Problems that are likely to occur shortly.

State the objectives of the session and emphasise that trainees will be able to keep the records with help from their supervisor.

Explain that during this session they will be shown how to complete the diary and the report sheet from information provided and that they will be shown how to take the necessary measurements during instruction on each of the operations and maintenance skills.

Explain the pattern of instruction:

DEVELOPMENT

1. Discuss the need for an operation diary. Issue each trainee with a blank diary sheet and using a blank demonstration diary sheet complete each column in turn explaining how the information is obtained and exactly what to enter.

Ask the trainees to enter up the columns on their sheets as the session proceeds.

Ask the trainees for questions to clear up any doubts and then issue each trainee with a new set of information and ask them to enter it in their diary sheet. When they have completed their sheets examine each one and correct with explanation of any mistakes.

If possible repeat the exercise by asking the trainees to take the actual measurements from the filter plant.

2. Discuss the need for a cleaning report and how it is done.
Issue each trainee with a blank cleaning report sheet and using a blank demonstration sheet complete each column in turn explaining how the information is obtained and exactly what to enter.

Ask the trainees to enter up the columns on their sheets as the session proceeds.

Ask the trainees for questions to clear up doubts and then issue each trainee with a new set of information and ask them to enter it in their blank sheet.

When they have completed their sheet examine each one and correct with explanation any mistakes.

3. Interpreting the Records

Issue each trainee with a sample completed diary sheet for a representative period and ask them to examine the information and deduce what it tells them in terms of how well the filter is operating.

Discuss the result and emphasise the usefulness of records.

Issue each trainee with a sample completed cleaning report for a representative period and ask them to examine the information and deduce what it tells them in terms of the condition of the filter.

Discuss the result and emphasise the usefulness of reports.

SUMMARY

Restate the reasons for records and reports and emphasis the need for accuracy and clarity.

PLANNED EXPERIENCE

Inform the trainees that they will be expected to keep an Operations Diary and a Cleaning Report.

They will be regularly inspected by their Supervisor who will complete an evaluation record when he feels they are competent to work on their own.

Record of Basic Training

This form has been designed to provide a record of the trainee's progress, instruction given, and assessment of the standard achieved for all the basic operation skills and knowledge needed for operation and maintenance of a slow sand filtration scheme.

It should be used in conjunction with the test results for each instruction plan contained in Chapter 5 and with the definitions of evaluating the trainees abilities given in table 3 in chapter 3.5 of this Section.

The form should be used as a basis for regular progress discussions with trainees in order to build confidence and highlight improvement areas.

Record of Planned Experience

This form should be used for recording when supervised practice sessions took place and for recording the results of the planned experience evaluation session. The number of supervised practice sessions for each operation skill is stated in the appropriate Instruction Plan.

Planned Experience Evaluation Records

The planned experience evaluation session is the final practice session when the person carrying out the evaluation observes the trainee at work and completes the Evaluation. The records have been designed to enable the person supervising Planned Experience to assess the trainees' final level of competence in the basic operations taught in the practical sessions of the training programme.

NAME OF TRAINEE.....

KNOWLEDGE LESSON	INSTRUCTOR	DATE	RESULT	REMARKS
Village water supply				
Water supply system from source to distribution				
Community participation				
Sanitation				
Water intake and pre-treatment				
The slow sand filter				
The filtration process and flow regulation				
Clear water storage and chlorination				
Water transport and distribution				
Control devices				

SLOW SAND FILTRATION SCHEME - CARETAKER

PLANNED EXPERIENCE

Name of Trainee

Date Planned Experience Commenced

Name of Scheme

Date Planned Experience Completed

ACTIVITY	SUPERVISED PRACTICE								PLANNED EXPERIENCE EVALUATION		
	DATE	INSTRUCTOR	DATE	INSTRUCTOR	DATE	INSTRUCTOR	DATE	INSTRUCTOR	DATE	INSTRUCTOR	REMARKS
Cleaning of raw water intake and pump											
Starting-up a new filter											
Operation procedure and daily adjustments											
Shutting down procedure											
Cleaning a filter bed											
Resanding a filter											
Sand washing by hose											
Sampling procedures											
Chlorination											
Plant records											
	<p>OVERALL ASSESSMENT:</p> <ol style="list-style-type: none"> 1) Able to operate and maintain filtration scheme without supervision 2) Able to operate and maintain filtration scheme with limited supervision (eg special circumstances like commissioning) 3) Only able to carry out a limited range of activities listed below <p>REMARKS:</p>										
	Instructor's Signature										Date:.....

PLANNED EXPERIENCE EVALUATION RECORDS

1. Raw water intake and raw water pump

Name of caretaker _____ Date carried out _____

Activities

Assesment

Did the caretaker?

yes no

1. Clean the intake screen
2. Check the inlet valve
3. Measure the depth of the sump
4. Check the water level in the sump
5. Look after the raw water pump

Remarks

Supervisor's signature _____ Date _____

2. STARTING UP A NEW FILER

Name of caretaker _____ Date carried out _____

Activities	Assessment	
Did the caretaker?	yes	no

1. Check that all valves were closed
2. Open under charging valve properly and close at correct time
3. Control charging rate at 0.1 m/h
4. Remove the floating impurities
5. Smooth the sand surface
6. Charge the bed in a correct way
7. Pass the filtered water into supply after the prescribed period.

Remarks

When completed discuss results with trainee and file form.

Supervisors signature _____ Date _____

3. OPERATING PROCEDURE AND DAILY DJUSTMENT

Name of caretaker _____ Date carried out _____

Activities

Assessment

Did the caretaker?

yes no

1. Regulate the top water level
2. Remove floating impurities
3. Measure the rate of filtration
4. Calculate the number of turns needed on filtered water valve
5. Check the rate after the flow has settled down
6. Know the procedure for declining rate filtration

Remarks

When completed discuss results with trainee and file form.

Supervisor's signature _____ Date _____

4. SHUTTING DOWN PROCEDURE

Name of caretaker _____ Date carried out _____

Activities Assessment

Did the caretaker? yes no

1. Shut the filtered water valve
2. Remove floating matter by surface flow over scum weir
3. Shut inlet valve and open filtered water valve
4. Lower the water level in the bed to the level of the weir
5. Open top water drainage valve and emptying valve
6. Drain off water to a level of 0.1 m to 0.2 m below sand surface
7. Increase filtration rate of the other bed by slightly opening filtered water valve on each of the other beds in two or three stages until required output is reached

Remarks

When completed discuss results with trainee and file form.

Supervisor's signature _____ Date _____

5. CLEANING A FILTER BED

Name of caretaker _____ Date carried out _____

Activities Did the caretaker?	Assessment	
	yes	no

1. Check that water is 0.1 m to 0.2m below sand surface level
2. Check that surface is dry enough to scrape
3. Scrub the walls clean
4. Decide what equipment is needed
5. Clean an area at foot of steps to place equipment on
6. Mark bed out in 3m squares with scraping in the middle of each square
7. Erect ramp and lay out boards
8. Remove scrapings using boards for moving about
9. Record scrapings removed
10. Remove boards and equipment
Rake and smooth surface of sand
11. Smooth surface of sand
12. Adjust inlet box to new sand level
13. Check for and repair leakages
14. Check depth of sand bed
15. Examine condition of exposed valves and filter equipment
16. Recharge the filter within a reasonable period of time.
17. During the whole operation observe hygiene precautions

Remarks

When completed discuss results with trainee and file form.

Supervisor's signature _____ Date _____

6. RESANDING FILTER

Name of caretaker _____ Date carried out _____

Activities	Assessment	
Did the caretaker?	yes	no

1. Make a sensible decision to resand according to thickness of sand bed and water demand
2. Clean the filter-bed.
3. Open emptying and shut after water has reached gravel level
4. Divide bed into strips, remove sand from first strip and stack to one side in a long ridge
5. Fill excavated trench with new sand and cover with old sand from next strip
6. Repeat 4 and 5 until the bed is resanded
7. Smooth surface of sand
8. Adjust inlet box to new sand level
9. Check for and repair leakages
10. Examine condition of exposed valves and filter equipment
11. During the whole operation observe hygiene precautions
12. Recharge the filter within a reasonable period of time

Remarks

When completed discuss results with trainee and file form.

Supervisor's signature _____ Date _____

7. SANDWASHING BY HOSE

Name of caretaker _____ Date carried out _____

Activities	Assessment	
Did the caretaker?	yes	no

1. Wash immediately after scraping
2. Load sand correctly
3. Ensure that all contaminations are washed out
4. Take care to avoid removal of fine particles
5. Check the quality
6. Dry the sand properly
7. Store the sand in a place free from contamination
8. Thoroughly clean platform drainage and piping
9. Remove dirt from sedimentation pit

REMARKS

When Completed discuss results with trainee and file forms.

Supervisor's signature _____ Date _____

8. SAMPLING PROCEDURES

Name of caretaker _____ Date carried out _____

Activities	Assessment
Did the caretaker?	yes no
1. Find out the exact place to take the sample	
2. Obtain and clean the correct equipment and sterilize	
3. Collect the sample correctly	
6. Take sample for turbidity test and compare with prepared standard	
7. Take sample for chlorine residual test and add correct reagent	
8. Allow sufficient time for colour to reach maximum intensity before comparing with standard	

REMARKS

When completed discuss results with trainee and file form.

Supervisor's signature _____ Date _____

9. CHLORINATION

Name of caretaker _____ Date carried out _____

Activities	Assessment	
Did the caretaker	yes	no

1. Store the chlorine correctly
2. Ventilate the store room
3. Prepare the proper solution
4. Check the chlorinator
5. Fill the chlorinator
6. Regulate the outflow of the chlorinator

Remarks

When completed discuss results with trainee and file form.

Supervisor's signature _____ Date _____

10. PLANT RECORDS

Name of caretaker _____ Date carried out _____

Activities	Assessment
Did the caretaker?	yes no

1. Keep a good operation diary

2. Keep a cleaning report

Remarks

When completed discuss results with trainee and file form.

Supervisor's signature _____ Date _____