Type designs for small water supply systems
Type designs for small water supply systems
DETAILS OF A KING-POST TRUSS

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

DETAILS OF PAVING SLABS

WATER CATCHMENT AND UNDERGROUND TANK

TANZANIA

All dimensions in cm, unless otherwise shown
FILTER UNIT FOR DOMESTIC CANAL WATER SUPPLY  
SUDAN
Street typical section

Principal pipe to be located at 0.5 mts from curve. Where it doesn't exist locate if a 2.000 mts from property in small alleys @ 1.50 m from center of street. Where possible pipe should be installed in the North or West Side of streets.

Tool for interrupting service and lift box LID

Important: design the mouth in accordance to valve types being used

House connection asbestos cement 3''

in PVC, φ > 4''

Rust iron φ > 3

In PVC, φ ≤ 4'' build a sleeve

Asb. cem. φ < 3'' use saddle

All dimensions in cm, unless otherwise shown

HOUSE CONNECTION
GO 1 x 60 Monhole with 75 x 60 x 75 x 60
Cover of Timber

Ventilator

75 x 60 Protection Guard made with 1/4" @ Bar welded to
ladder at 90 c/c
2" x 3/16" M.S. Flats

For reinforcement

Overflow

2" x 3/16" M.S. Flats fixed to Wall

SECTION A-A

ELEVATOR

HALF SECTIONAL DE-
TAIL OF TANK

ROOF slab

10 Courses 1
3/8" @ Bar per
course

10 Courses 2
Nos 3/8" @
Bars per
course

For reinforcement

24 Nos 3/8" @ Bars @ 15 c/c
in both directions (Top)

3 Nos 3/8" @ Bars @ 24 c/c
in both directions (Bottom)

DETAIL OF FLOOR & ROOF
REINFORCEMENT

DETAIL OF SLIDING JOINT
BETWEEN WALL & FLOOR SLAB

PART TANK AND WALL PLAN

DETAIL OF FOUNDATION
REINFORCEMENT

DETAIL OF BLOCK-
WORK

DETAIL OF VENTILATOR & TIMBER
COVER

All dimensions in cm, unless otherwise shown

25 m³ R.C. CIRCULAR WATERTANK ON 6 m HIGH

TANZANIA
INFECTION GALLERY

ECUADOR

All dimensions in cm, unless otherwise shown
LOW HEAD RAPID GRAVITY FILTER
WITH PUMP SUMP

TANZANIA
**ELEVATION RELATIONS**
- Max. W. Level \( e_1 \)
- Bottom of sedimentation tank \( e_2 \)
- Reformed ground \( e_3 \)
- Centre line level of pipe \( e_4 \)
- Centre line level of inlet pipe \( e_5 \)

**BASIC DIMENSIONS**
- Ground widths \( b_1, b_2 \)
- Lengths \( L \) (max. 2000 cm)
- Depth of water \( h \) (max. 155 cm)

**DIAMETERS**
- Inlet \( d_1 \)
- Outlet (by pass) \( d_2 \)
- Overflow \( d_3 = 150 \, \text{mm} \)
- Drain pipe \( d_4 = 80 \, \text{mm} \)

**LEGEND:**
1. Blinding concrete
2. Watertight reinforced concrete
3. Benching to gradient
4. Cement screed
5. Steel cover
6. Wood cover
7. Steel ladder
8. Overflow
9. Flanged pipes and fittings in chambers
10. Perforated distribution pipe
11. Perforated collection pipe
12. Hand operated valve
13. Make-up piece
14. Blind flange
15. Anchoring

All dimensions in cm, unless otherwise shown
WEIR INTAKE

### INLET TYPES

<table>
<thead>
<tr>
<th>TYPE</th>
<th>DIMENSIONS</th>
<th>APROX CONTRACTION COEFF.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Simple grate</td>
</tr>
<tr>
<td>1</td>
<td>1 cm 1.0 cm</td>
<td>0.45</td>
</tr>
<tr>
<td>2</td>
<td>1 cm 2 cm</td>
<td>0.55</td>
</tr>
<tr>
<td>3</td>
<td>1.5 cm 1 cm</td>
<td>0.45</td>
</tr>
<tr>
<td>4</td>
<td>1.5 cm 2 cm</td>
<td>0.55</td>
</tr>
</tbody>
</table>

All dimensions in cm, unless otherwise shown.
GRIT CHAMBER

For Water Temp. 1+20°C
Removal of Particles
Size 7.5 x 10^-1 cm

All dimensions in cm, unless otherwise shown
A-E = Cross sections
F = Reinforced-concrete shoe
G = Hollow bricks laid sideways. Water enters the filter section I through the holes in the brick.
H = Hollow bricks laid flat. Water enters the well through small holes designated by L. See detail H and F.
I = Sand filter section between brick walls
J = Height of filter section, varies with depth of penetration into ground water
K = Reinforced-concrete beams
L = Small perforations through bricks H. See detail F.
M = Layer of round stones
N = Layer of gravel
O = Layer of coarse sand
P = Iron steps, 50 cm (20 in.) apart
Q = Grate made of concrete beams

AMAZON WELL
ALUM DOSING TOWER

All dimensions in cm, unless otherwise shown.
I.R.C. SLOW SAND FILTER
Nomograph for 60° and 90° V-notch weirs.

Nomograph for rectangular weirs.

Types of weirs.
NOMOGRAPH FOR SOLUTION OF THE MANNING FORMULA (METRIC UNITS)

Values of “n” in Manning Formula

Type of Channel
Closed Conduits
- Cast Iron: 0.013
- Concrete: 0.011
- Steel: 0.013
- Cast Iron: 0.014
- Clay, Vitrified: 0.012
- Corrugated Metal: 0.024
- Brickwork: 0.013
- Sanitary Sewers, coated with slime: 0.013

Open Channels, Lined
- Asphalt: 0.013 to 0.016
- Brick: 0.013 to 0.015
- Concrete: 0.013
- Trowel Finish: 0.013
- Float Finish: 0.015
- Unfinished: 0.017

Concrete, bottom flat finished, with sides of:
- Dressed stone: 0.017
- Random stone: 0.020
- Cement Rubble Masonry: 0.015
- Dry Robe or riprap: 0.010
- Gravel Bottom, sides of:
  - Random stone: 0.013
  - Gravel: 0.003

Excavated or Dredged
- Earth, straight and uniform: 0.018 to 0.027
- Earth, winding and sluggish: 0.025 to 0.040
- Trenches, not maintained, weeds and brush uncet: 0.080 to 0.100

Natural Stream
- Streams:
  - Clean stream, straight: 0.030
  - Stream with pools, sluggish reaches, heavy underbrush: 0.100
- Flood Plains:
  - Pasture, no brush: 0.010
  - With some brush: 0.05 to 0.100
NOMOGRAPH FOR HAND PUMP DISCHARGE

EXAMPLE

GIVEN:
- DIAMETER = 3 INCHES
- STROKE = 10 INCHES
- FREQUENCY = 40 STROKES/ MINUTE

FIND:
- DISCHARGE FROM PUMP

ANSWER: 12.2 U.S. GALS PER MINUTE

NOTE: NOMOGRAPH BASED ON 100 PERCENT GEOMETRIC CYLINDER DISPLACEMENT FOR SINGLE ACTION, RECIPROCATING HAND PUMPS (ZERO SLIP)
HYDRAULIC FLOCCULATOR WITH REMOVABLE BAFFLES
Given a 90° pipe elbow with an inside diameter (D) of 12 in (30.5 cm) and a bend radius (R) of 24 inches (61 cm).

For a manometer reading (AH) of 13 ft (3.9 m), what is the rate of flow?

Answer: Rate of flow: 3200 gpm (12200 lpm)
HYDRAULIC RAM: INSTALLATION DETAILS

HYDRAULIC RAM INSTALLATION

HYDRAULIC RAM OF PIPE FITTINGS

A VIEW OF HYDRAM CONSTRUCTED FROM PIPE FITTINGS

Pipe hydraulic ram as illustrated is based on the design given in the manual on the ram for pumping water by S.B. Watt. (Intermediate Technology Publications Ltd, London)

All dimensions in cm, unless otherwise shown.
I.R.C. SLOW SAND FILTER
I.R.C. SLOW SAND FILTER
NOMOGRAPH FOR SOLUTION OF THE
HAZEN-WILLIAMS FORMULA (METRIC UNITS)

Values of "C" for Hazen-Williams Formula

<table>
<thead>
<tr>
<th>Type of Pipe</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Cement</td>
<td>140</td>
</tr>
<tr>
<td>Brass</td>
<td>130</td>
</tr>
<tr>
<td>Brick Sewer</td>
<td>100</td>
</tr>
<tr>
<td>Cast Iron</td>
<td></td>
</tr>
<tr>
<td>New, Unlined</td>
<td>130</td>
</tr>
<tr>
<td>Old, Unlined</td>
<td>120</td>
</tr>
<tr>
<td>Cement Lined</td>
<td>130-150</td>
</tr>
<tr>
<td>Bitumastic Enamel Lined</td>
<td>140-150</td>
</tr>
<tr>
<td>Tar-Coated</td>
<td>115-125</td>
</tr>
<tr>
<td>Concrete or Concrete Lined</td>
<td></td>
</tr>
<tr>
<td>Steel forms</td>
<td>140</td>
</tr>
<tr>
<td>Wooden forms</td>
<td>120</td>
</tr>
<tr>
<td>Centrifugally Spun</td>
<td>135</td>
</tr>
<tr>
<td>Copper</td>
<td>130-140</td>
</tr>
<tr>
<td>Fire Hose (Rubber Lined)</td>
<td>135</td>
</tr>
<tr>
<td>Galvanized Iron</td>
<td>120</td>
</tr>
<tr>
<td>Glass</td>
<td>140</td>
</tr>
<tr>
<td>Lead</td>
<td>130-140</td>
</tr>
<tr>
<td>Masonry Conduit</td>
<td>120-140</td>
</tr>
<tr>
<td>Plastic</td>
<td>140-150</td>
</tr>
<tr>
<td>Steel</td>
<td></td>
</tr>
<tr>
<td>Coal-Tar Enamel Lined</td>
<td>145-150</td>
</tr>
<tr>
<td>New Unlined</td>
<td>140-150</td>
</tr>
<tr>
<td>Riveted</td>
<td>110</td>
</tr>
<tr>
<td>Tin</td>
<td>130</td>
</tr>
<tr>
<td>Vitrified</td>
<td>100-140</td>
</tr>
<tr>
<td>Wood Stave</td>
<td>120</td>
</tr>
</tbody>
</table>

Down spout from roof
Screen
Monoflo cover
Caulking
Roof washer receives first runoff from roof
Faucet
Hopper valve
Screen
Sandfilter (May be used in place of roof washer)
Max. Water level
CISTERN
### Table of Tank Selections

<table>
<thead>
<tr>
<th>Q x 11/s</th>
<th>Dyn Press</th>
<th>Min Inlet Press</th>
<th>Inlet</th>
<th>Outlet</th>
<th>Overflow &amp; Drain</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>80 ± 100</td>
<td>10.00</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>30</td>
<td>60 ± 100</td>
<td>10.00</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>35</td>
<td>50 ± 100</td>
<td>15.00</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>40</td>
<td>40 ± 100</td>
<td>15.00</td>
<td>4&quot;</td>
<td>6&quot;</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

### List of Accessories

<table>
<thead>
<tr>
<th>No.</th>
<th>Quantity</th>
<th>Description</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Dresser (Threaded One Side)</td>
<td>3&quot; x 4&quot;</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Pipe G1 (Threaded One Side)</td>
<td>3&quot; x 60</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Pipe G1</td>
<td>6&quot; x 15</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Flanges</td>
<td>3&quot; x 4&quot;</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Float Valve (Flange Both Ends)</td>
<td>3&quot; x 4&quot;</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Pipe with Holes (Threaded Both Ends)</td>
<td>3&quot; x 95</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Cap G1</td>
<td>3&quot; x 4&quot;</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Pipe G1</td>
<td>6&quot; x 15</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>Pipe G1 (Threaded One End)</td>
<td>6&quot; x 35</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Gate Valve</td>
<td>6&quot;</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Lock &amp; Chain</td>
<td>6&quot;</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>Pipe G1 (Threaded One End)</td>
<td>6&quot; x 15</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>Pipe G1</td>
<td>6&quot; x 40</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>Gate Valve</td>
<td>6&quot;</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>Pipe G1 (Threaded One End)</td>
<td>6&quot; x 15</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>Elbows 90° G1</td>
<td>6&quot;</td>
</tr>
<tr>
<td>17</td>
<td>2</td>
<td>Elbows 90° G1</td>
<td>6&quot;</td>
</tr>
<tr>
<td>18</td>
<td>1</td>
<td>Pipe G2 (Threaded Both Ends)</td>
<td>5&quot; x 13</td>
</tr>
</tbody>
</table>

All dimensions in cm, unless otherwise shown.

### Plan

- **Section A-A**
- **Section B-B**

**Break Pressure Tank**

In case a float is not used, substitute it by an elbow 90°.

Venezuela

6.02
I.R.C. SLOW SAND FILTER
A. PLAN (OVERALL)

B. SECTION A-A
MASONRY CHAMBER

Concrete 1:2:4 mix
20 mm M.S. Rod hook
R.C. 1:2:4 mix

Brick/stone masonry in 1:4 mortar

Concrete 1:4:8

SECTION A-A

PRECAST CONCRETE CHAMBER

R.C. 1:2:4 mix
20 mm M.S. Rod hook

Concrete 1:2:4 mix

Dry brick ballast

Concrete 1:2:4 mix

with ø 6 mm M.S. rods

150 O.C. both way

Opening 125 x 125

SECTION B-B

FIRE HYDRANT POST

Air valve chambers, as above can also be used as meter chambers
Precast concrete chamber and masonry chamber

Opening to be closed
with conc. leaving
15 mm. gap around
the pipe which is to
be filled with bitumen

SECTIONAL PLAN C-C

PLAN

AIR VALVE CHAMBER AND FIRE HYDRANT POST

WHO/SEARO
RAPID GRAVITY FILTER PLANT FOR LAKE WATER

WHO/SEARO
**STRAINER**

VARIANT 1

- Generator unit complete with all electrical components
- Cable duct
- Caisson
- Electrical cable
- Discharge pipe
- Lifting chain
- Submersible dewatering pump

VARIANT 2

- Switchbox starter panel
- Discharge pipe
- Pump

VARIANT 3

- Pump

**SHAFT INTAKE**

- Motor
- Discharge pipe
- H.W.L. 100
- Discharge pipe

**BRIDGE INTAKE**

- Motor
- Discharge pipe
- H.W.L. 100
- Discharge pipe

**SLOPED CASING INTAKE**

- Flexible pipe
- Electrical cable
- Corrosion resistant hoisting rope or cable
- DN 700 mm (26.8 x 4.5 mm)
- 700 + 1000
- 1000 + 2000

**SUBMERGED CRADLE INTAKE**

- Buoy
- T.W.L.
- Electric cable
- Submersible dewatering pump
- Discharge hose
- Supporting frame

**STATIONARY INTAKE FOR SURFACE WATER**

All dimensions in cm, unless otherwise shown

WHO/SEARO
MASSORY PILLAR POST

TYPE 1

Pipe or Precast R.C. Pillar Type

100x100 mm
Concrete 1:2:4 mix

Sleeve, one pipe size larger than the supply pipe
(Annular space packed with wood)

Waste not tap

12 mm plaster 1:3 mortar

Concrete 1:3:6 mix

15 mm pipe

Type 2

Precast/cast in situ post
(100x100 mm top, 150x150 mm bottom)

or

Post of 80 mm CI
or 100 mm RC/AC pipe filled with conc 1:2:4 mix

Brick or Stone masonry 1:4 mortar

SECTION B-B

SECTION C-C

Drain to soakage pit or natural drainage

SECTION A-A

Brick masonry in 1:4 mortar

Pitcher stand

PLAN

PLAN

KEY DIAGRAM
TWO TAP PUBLIC STAND POST

20 mm
Supply pipe

Valve chamber

All dimensions in cm, unless otherwise shown

PILLAR TYPE PUBLIC STAND POST (FOUNTAIN)
Unconsolidated caving material, sand and gravel or sand

Clay, hardpan, silt or similar material to depth of more than 6 metres

Clay, hardpan, silt or similar material containing layer of sand or gravel within 4.5 m of ground surface

Creviced or fractured rock such as limestones, granite and quartzite

Temporary casing (if required)
- Puddle clay or cement grout up to 1 m
- Temporary outer casing withdrawn after lowering assembly

Pumping water level
- Casing up to 6 m or 1.5 m below pumping W.L. whichever is more

Medium sand
- Casing size 32 mm (min)
- Screening size 32 mm or 40 mm o (min)

Sand and gravel
- Ball plug

Sand aquifer

Where pumping level is less than 7.5 m from the surface, casing should extend 3 m below the pumping level

For gravel packing drill hole to be (O.D.) dia of casing or liner pipe/screen +150 mm (min)

SANITARY PROTECTION OF WELLS
CEMENT GROUTING

WHO/SEARO

1.02
Variable length acc according to aquifer

Valve box (See additional plan)

Overflow of drain $\phi 2.01$

Elbow

Water level in spring should be at least 5 cms above overflow

Metal to be protected with two layers of anticorrosive paint and two final layers of metallic paint on both sides

All dimensions in cm, unless otherwise shown
Small Stream Catchment Intake with Low Dam
**DOSING OF 70% HYPOCHLORITE**

**PLASTIC JERRYCAN CHLORINATOR**

All dimensions in cm, unless otherwise shown.
ELEVATED SERVICE RESERVOIR 65 m³ CAPACITY

NOTE: For Dimensions of 14 m³ Capacity Tank See Guide Notes
ALTERNATIVE DESIGN OF IMPULSE VALVE

Valve weights

Thick rubber washer

Mild steel bolt 6 mm, long 50 mm

Valve spring

Thin walled metal tube 10 mm bore

60 mm long

Mild steel bolt 4 mm for spring tension

Rubber washer 40 mm

Steel washer

ASSEMBLY OF IMPULSE VALVE STEM & SPRING TENSION BOLT

Pipe connector

Valve plate

Weld

Pin moves in and out with each squirt of water keeping holes clean

Valve can be unscrewed and replaced

DETAIL A

PIPE CONNECTOR

WELDING CONNECTOR TO PLATE

SPRING - BENT TO SHAPE FOR IMPULSE VALVE

M.S. SPRING STRIP

All dimensions in cm, unless otherwise shown

CONSTRUCTION OF DELIVERY VALVE

SECTION A-A

CLACK VALVE IN GUIDE

DELIVERY NON RETURN VALVE ALTERNATIVE DESIGNS

FLEXIBLE RUBBER WASHER

M.S. SPRING STRIP

PERFORATED L VALVE PLATE

VALVE PLATE

F 4 mm BOLT

650 x 30 x 2 mm M.S. Strip

HYDRAULIC RAM: COMPONENTS

WHO/SEARO
CLEAR WATER STORAGE RESERVOIR
WITH DOMEROOF

All dimensions in cm, unless otherwise shown.
MASONRY DISTRIBUTION TANK 20 m³

All dimensions in cm, unless otherwise shown.

MEXICO
HAND PUMP UNIT
FOR PUBLIC USE
CAPACITY 1000 LITRES/HOUR

Perforated precast slab 50 mm thick
3 pieces, with 6 mm ø holes 80 mm O.C. (removable)

Ventilator of 50 mm dia.
G.I. pipe with brass mesh
6 mm. M.S. rods 100 mm c.k.
vertically & horizontally

200 x 200 conc. 1:2:4 mix.
pump foundation
Reducer
300 - Waste not top 15 mm.

Platform in brick masonry 1:6 mortar

SECTION A-A

PLAN

HAND PUMP WITH IRON REMOVAL UNIT

WHO/SEARO