IRON REMOVAL PLANT

IN

FERRO-CEMENT CONSTRUCTION AND MAINTENANCE

CONTENTS

(I) INTRODUCTION

The water quality problem as identified by NEERI team during 1986-87 in Phulbani District is mainly of excess iron. It has been observed on-the-spot and further confirmed by detailed instrumental analysis that most of the tubewell water contain high concentration of iron. Maximum concentration which was observed in Phulbani District is 17.1 mg/L. The acceptable norm for iron content is 1 mg/L. Interestingly, wherever alternate source of water such as open well, nallah or chuas is available, the villageers prefer these sources for water collection. Wherever iron content is high in tubewells, villagers do not use this source for drinking purposes because of organoleptic considerations, but make use of it for washing, bathing and other purposes. The general complaint made by villagers is that of blackening of rice and tea while using the tubewell water which contains high iron. Water kept overnight in vessels leave a brownish-black deposits on the walls of the container. It was confirmed that villagers, particularly women folk, while bathing complain of sticky hair when they use tubewell water. A typical phenomenon observed among villagers of Phulbani district was blackening of teeth and nails wherever they are using heavy iron contained tubewells.

Nearly 70 percent of rural drinking water needs in India is met from ground water resources. Ground water in general do not need any special treatment, but in parts of our state ground water contain excessive iron. Iron when present in water in concentration greater than 1 mg/L impacts a typical metallic taste. From aesthetic and economic considerations excess iron (>1.0 mg/L) has to be removed from potable water.

Iron in ground water may be present in different forms and its removal can be effected by simple methods such as aeration with or without sedimentation followed by filteration. An iron removal plant, attached to the hand pump, will remove most of the iron from the water, thus making it acceptable for the village.

The iron removal plant in this unit, is based on DANIDA's design and is constructed

in Ferro-cement. Ferro-cement is a thin walled type reinforced cement concrete, in which the mortar is reinforced with either a single or multiple layers of wire meshes welded with small diameter steel wires.

There are two types of ferro cement. Iron removal plants now in operation in Kandhmal district namely (1) Cylindrical type and (2) Rectangular type. Out of the two the cylindrical type is easier for construction at much lower cost. But rectangular type though requires better workmanship shows excellent results in reducing the iron content to almost nil and also the maintenance is lesser as compared to cylindrical type.

In this type of rectangular ferrocement iron removal plant, iron is removed through aeration and then sedimentation and finally filteration. Firstly this type of IRP has been installed over the ground adjacent to tubewell and the water from the tubewell will be entered into the aeration tank by lift and force method. But now the present design has been made in which the total tank will be sunk 2'0" depth below the ground and the tubewell will be raised 1'6" height by putting one 1'6" length 6" dia G.I. short piece and finally the water from the tube well will go to the aeration chamber by gravity. This prevents frequent leaking of gland in the water chamber. The step by step method of construction of rectangular ferrocement IRP is given below.

(II) TOOLS

The following tools are required for construction of ferrocement structures.

(a) **SKELETON MAKING / REINFORCEMENT WORK :**

1. Measuring tape 1 No.
2. Chisel (25 mm width) small 1 No.
3. Hammer (2 kg) 1 No.
4. Bar bending key for 6 mm rod 1 No.
5. Bar bending slab (Flat slab with nails) 1 No.
6. Mesh cutter (16-18 gauge wire) 1 No.
7. Wire tying key 1 No.

(b) **PLASTERING / MASON's WORK :**

1. Trowel (small size) 1 No.
2. Trowel (medium size) 1 No.
3. Long strip trowel 1 No.
4. Spirit level (15 cm) 1 No.
5. Plumbing bob 1 No.
6. Pan (Tasla) 1 No.
7. Tamping rod 1 No.
8. Wooden trowel 1 No.
9. Spade 1 No.
10. Sieve for size (0-2 mm) 1 No.

(c) **MISCELLANEOUS ITEMS :**

1. Chalk marker 4 pieces
2. Lime Powder 1.5 kg
3. Thread (Jute Thread) 1 kg
4. Bucket and Mug 1 set
5. Old newspapers 4 kg
6. Bricks 100 Nos.

(III) SPECIFICATIONS

Materials for construction of ferro-cement iron-removal plant :

1. Cement - Ordinary portland cement
2. Sand - Coarse medium sand of size 0-2 mm, free from silt, clay or organic contamination.
3. Welded 18 gauge wire mesh of 13 mm size - Mild steel not galvanised (for tank body)
4. Welded 18 gauge wire mesh of 20 mm size - mild steel (for porforated filter slab)
5. Tying wire - M.S. of 22 gauge
6. Mild steel rod - 6 mm diameter
7. PVC slotted pipe - PVC pipe slotted on half the side with 13 mm spacing and 3 mm holes.

NOTE : 1. Use 1 kg of water proof compound per bag of cement.

BILL OF QUANTITIES

(A) CYLINDRICAL IRON REMOVAL PLANT :

The following materials are required for Tank size of;

Diametre : 1.20 M.
Height : 1.05 M.
Wall Thickness : 35 mm

Sl.No.	Materials	Quantity	Approx. cost (Rs.)
1	Cement	6 bags	780.00
2	Medium coarse sand (0.2mm)	0.42 Cum	150.00
3	Steel rod (6mm dia M.S)	20 Kg	320.00
4	Welded wire mesh - 13mm Welded wire mesh - 20mm	6.6 m^2 1.5 m^2	1065.00 194.00
5	Store chips	0.30 Cum	170.00
6	Bricks	100 Nos.	100.00
7	Water-proof compound	6 Kg	126.00
8	Tying wire - 22 guage	1 Kg	30.00
9	Old Newspaper	3 Kg	30.00
10	Jute rope	1/2 Kg	20.00
11	15mm PVC pipe	9.0 M.	60.00
12	Brick khoa	0.21 Cum	30.00
13	110mm PVC end cap	3 Nos.	180.00
14	110mm PVC pipe	3.0 M.	600.00
15	100mm dia 10" long G.I. short piece	1 No.	100.00
16	100mm dia G.I. threaded flange	1 No.	142.00
17	100mm dia M.S. blank flange	1 No.	228.00
18	25mm G.I. socket	2 Nos.	40.00

BILL OF QUANTITIES AND ESTIMATE

(B) **RECTANGULAR TYPE :**

The following materials are required and the approximate cost of each item is given below.

Sl.No.	Materials	Quantity	Approximate Cost in Rupees
1.	Cement	9 bags	1125.00
2.	Medium coarse sand	1.00 cum	220.00
3.	Steel rod (6mm dia)	35 kg	565.00
4.	Welded wire mesh - 13mm size	13.14 sq.m	1980.00
	Welded wire mesh - 20mm size	1.10 sq.m	144.00
5.	Stone chips (6mm size)	0.40 cum	170.00
6.	Water proof compound	9 kg	190.00
7.	Tying wire - 22 gauge	1½ kg	45.00
8.	Old newspaper	4 kg	40.00
9.	Jute rope (Thread)	1 kg	40.00
10.	K.B. brick	100 Nos.	100.00
11.	Brick Khoa	0.35 cum	50.00
12.	110 mm PVC pipe	3.0 m	600.00
13.	110 mm PVC end cap	3 Nos	180.00
14.	100 mm G.I. short piece	2 Nos	200.00
15.	100 mm G.I. threaded flange	2 Nos	290.00
16.	100 mm M.S. blank flange	2 Nos	456.00
17.	25 mm G.I. Bend for overflow	1 No	25.00
18.	25 mm G.I. socket	2 Nos	20.00
19.	PVC Tube (16 mm size)	15 mtrs	125.00
20.	25 mm dia short piece (0.40 m long)	1 No	50.00
21.	Suitable pipe fitting for tap & elbows	1 set	100.00

Sl.No.	Materials	Quantity	Approximate Cost in Rupees
22.	15 mm PVC pipe for filter plate	6.0 m	40.00
23.	1/2"x2" Img Nuts	8 Nos	28.00
	1/2" bolts	8 Nos	12.00
24.	Rubber insuration	3 kg	102.00
25.	32 mm G.I. pipe	2.0 mtr	190.00
26.	32 mm G.I. elbow	2 Nos	90.00
27.	12 mm B.S. connecting rod	1 No of 3.0 mL	120.00
28.	150 mm G.I. pipe (short piece fitted with hand pump)	0.45 m	260.00
29.	Filter media		
	6 mm to 8 mm size gravel	0.17 cum	170.00
	10 mm to 12 mm size gravel	0.04 cum	48.00
	19 mm to 38 mm size gravel	0.04 cum	48.00
30.	Coarse sand as filter media	0.08 cum	80.00
		Total	7903.00
31.	Labour for earthwork in excavation, construction of tank, aeration chamber, filter plates, lid slabs, construction of inspection chamber and drain.	1 Mason + 2 Helpers for 10 days	1080.00
32.	Labour for fitting, fixing and washing of the filter media	—	180.00
33.	Labour for making slotting of PVC pipes	—	120.00
34.	Construction of one no. soak pit (1 m dia & 1 m depth)	—	717.00
		Grand Total	**10000.00**
		(Rupees Ten Thousand only)	

(IV) CONSTRUCTION

(A) CYLINDRICAL TYPE

Tank diameter	:	1.2 m
Height	:	1.05 mt

This covers the step-by-step procedure for construction of iron-removal plants over a period of five days.

STEP I : SKELETON CAGE WITH MESH FRAMEWORK

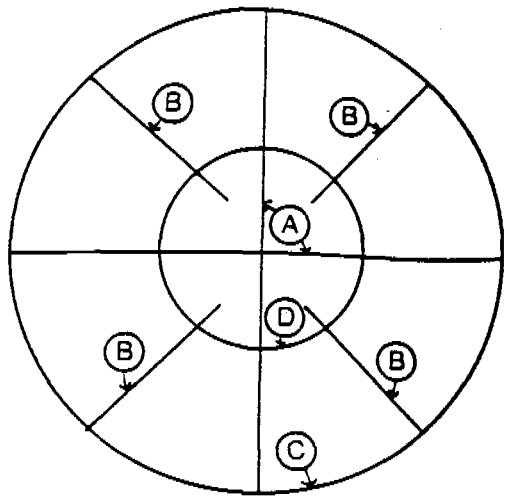
- Steel rods to be cut and bent as per Sketch I and Sketch II
- Place rings at a spacing of 0.35 mt
- Tie the welded mesh and fold in the excess mesh at the base

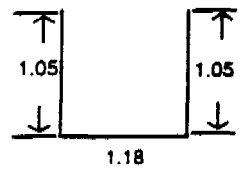
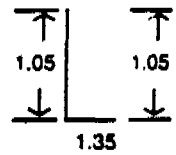
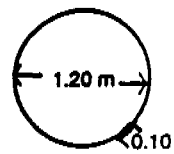
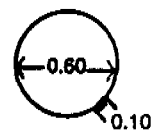
Materials :

1.	Steel bar	-	35 m
2.	Tying wire	-	1/2 kg cut into 15 cm strips
3.	Mesh 18 gauge (13 mm)	-	4'0" ht x 12'9" long = 4.75 sq.m

Labour Required :

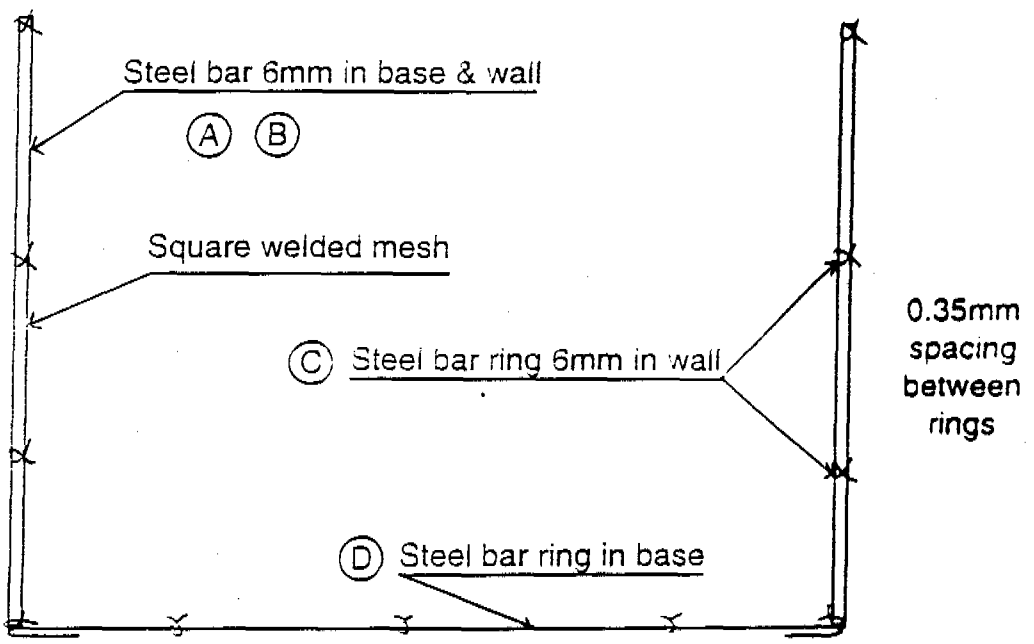
Bar-bender/mason	1 for 1 day
Helper	2 for 1 day



(A)	Base & Wall	2 Nos.	3.28 each	
(B)	Partly in base in wall	4 Nos.	1.40 each	
(C)	Ring in wall	4 Nos.	3.87 each (3.77 + 0.10)	
(D)	Ring in base	1 No.	1.98 (1.88 + 0.10)	

DETAILS OF STEEL BAR FOR BASE AND WALL
(6 mm)

Fig. I



DETAILS OF STEEL REINFORCEMENT

FIG. II

STEP II : FOUNDATION AND BASE CASTING

1. Clean the site and level the surface

2. Draw a circle of radius 0.8 m with lime powder

3. Dig 20 cm in the marked area

4. Cover with stone chips, add water and compact to a depth of 16cm.

5. Now mark a circle with radius 0.65 cm and place the bricks on the outside of this circle.

6. Lay concrete mortar (1:2:4) inside the circular mark, to a thickness of 4 cm. Place the skeletal cage on the first layer and place remaining mortar on the base of skeleton, about 3 cm in thickness. Sprinkle with water and cover with wet gunny bags or leaves. Allow to set for at least eight hours.

Materials :

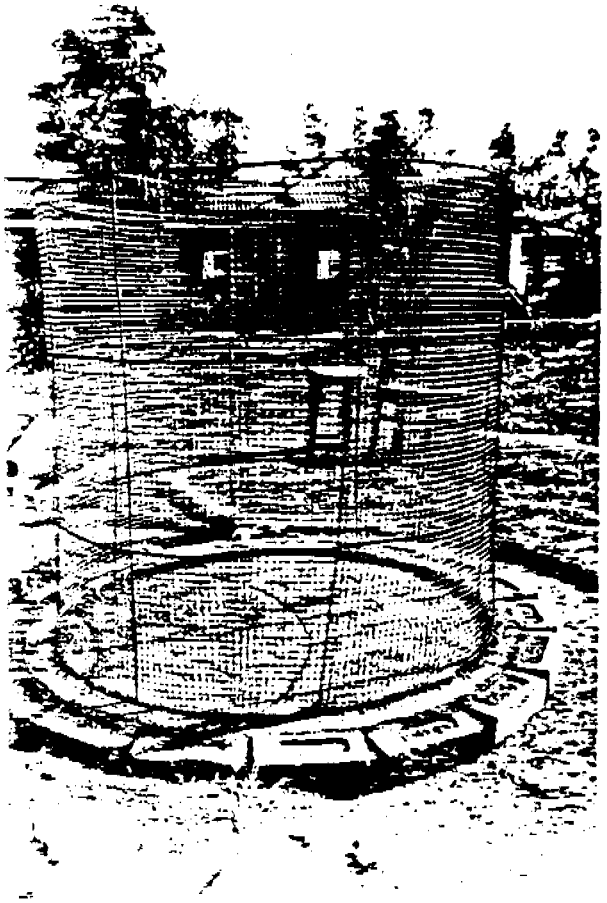
1.	Cement	-	0.75 bags
2.	Sand	-	0.50 bag
3.	Stone chips	-	3 bags

Labour Required :

Mason	1 No.	Two hours
Helper	2 No.	Two hours

STEP II

Filling excavated site with concrete



Placing the skeletal mesh in position

STEP III : FILTER PLATE FRAMEWORK AND PLASTERING

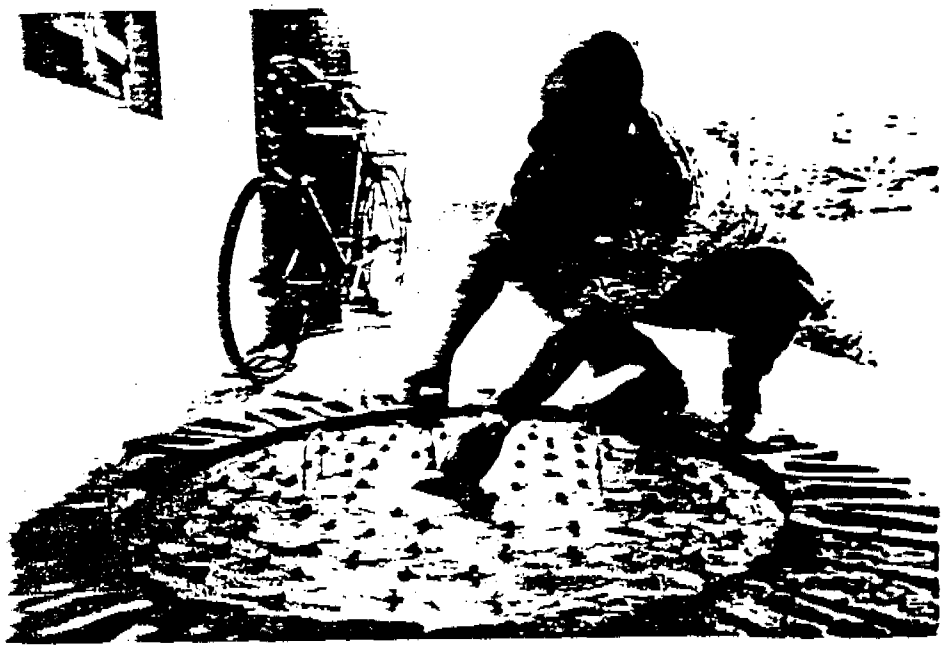
1. Straighten and cut the steel bars according to given design in Figure-III.
2. First make the main ring; then tie all the rods with the edge of the ring.
3. Cut the 20 mm wire mesh of dia 0.55 m
4. Place over rings and tie in a number of places (about 50)
5. Cut about 130 pieces of 6 cm pipe from dia 20 mm.
6. Embed pipe in the wire mesh.
7. Mix (1:3) and apply 5 cm thick layer on the entire ring. Avoid filling tubes.
8. Fix two handles in the slab.
9. Allow to cure for seven days by sprinkling and covering with leaves or wet gunny bags.

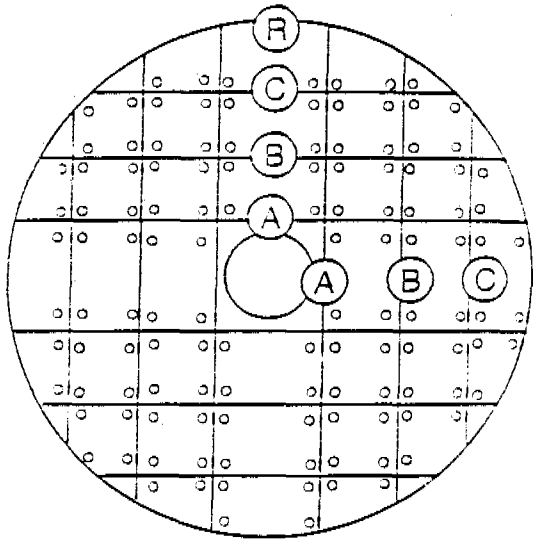
Material :

1.	Steel bar 6 mm	-	15 m
2.	Tying wire	-	200 gm
3.	Wire mesh	-	1.5 m2
4.	PVC tube 20 mm dia 6 cm length	-	8.5 m (130 pcs)
5.	Sand	-	1 bag
6.	Cement	-	1/3 bag

Labour Required :

Mason	1 No	Remaining part of the day
Helper	2 No	Remaining part of the day





PERFORATED PLATE FOR FILTER MEDIA BASE

(R)	Ring	1 No.	3.36 + 0.10 = 3.46	6 mm	**1.07 Dia**
(A)	Cross Bar	4 No.	1.07 each	6 mm	
(B)	Cross Bar	4 No.	0.95 each	6 mm	
(C)	Cross Bar	4 No.	0.71 each	6 mm	

Fig. III

STEP IV PROJECTION FOR RESTING FILTER PLATE

- Make a mould by placing vertically on the inside of the skeleton cage, leaving 5 cm between the cage and edge of brick
- Cut the mesh and place the drain pipe with blank flange
- Fill/pack the mortar (1:2:4) inside, between the brick mould and the skeleton wall
- After two hours, remove the bricks from the mould
- Sprinkle with water and allow to set overnight

Material :

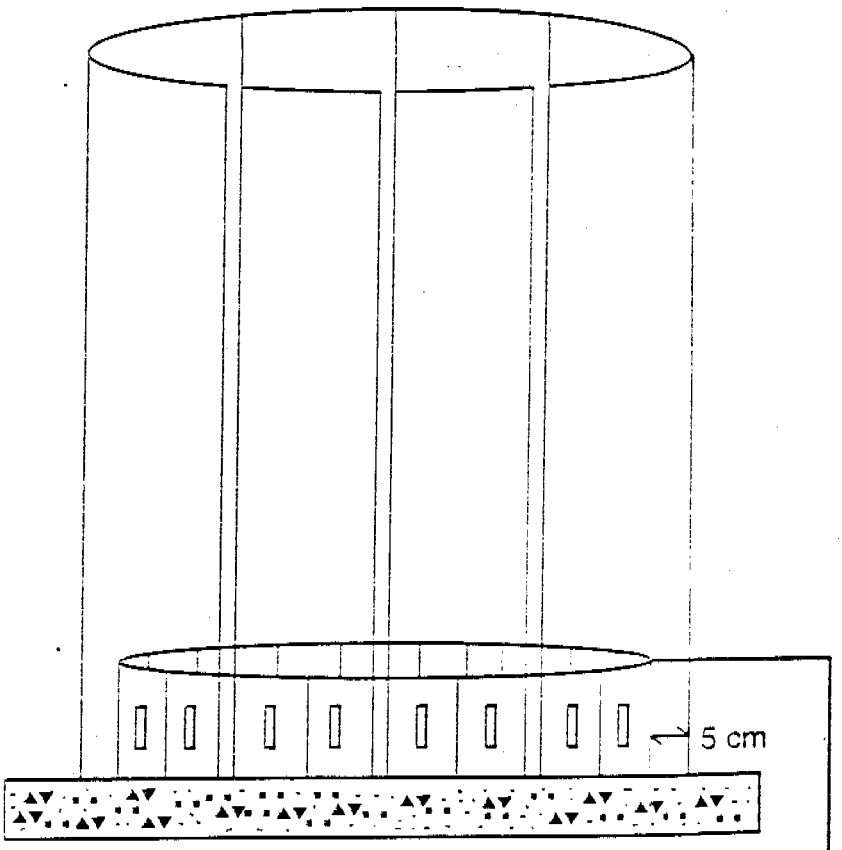
1.	Cement	-	1 bag
2.	Sand	-	2 bags
3.	Stone chips	-	4 bags
4.	Drain-pipe with blank flange	-	1 No.

Labour Required :

Mason	-	Approx. two hours
Helper	-	Two hours

Note : A newspaper sheet is held on the outside: while concrete is poured into the gap.

STEP - IV



mold prepared **by placing** bricks vertically **inside the** skeletal frame

STEP V AERATION CHANNEL :

- Cut and bend the wire mesh into 0.4 m x 0.3 m x 0.4 m size
- Place the cap of 100 mm dia pipe. Mark the size and cut a hole in the bottom of the channel
- Tie old newspapers around the framework
- Pour 1:3 from the inside of the framework
- Allow to set for two hours
- Cut and insert PVC pipes for marking holes
- Leave it for twentyfour hours

Next Day :

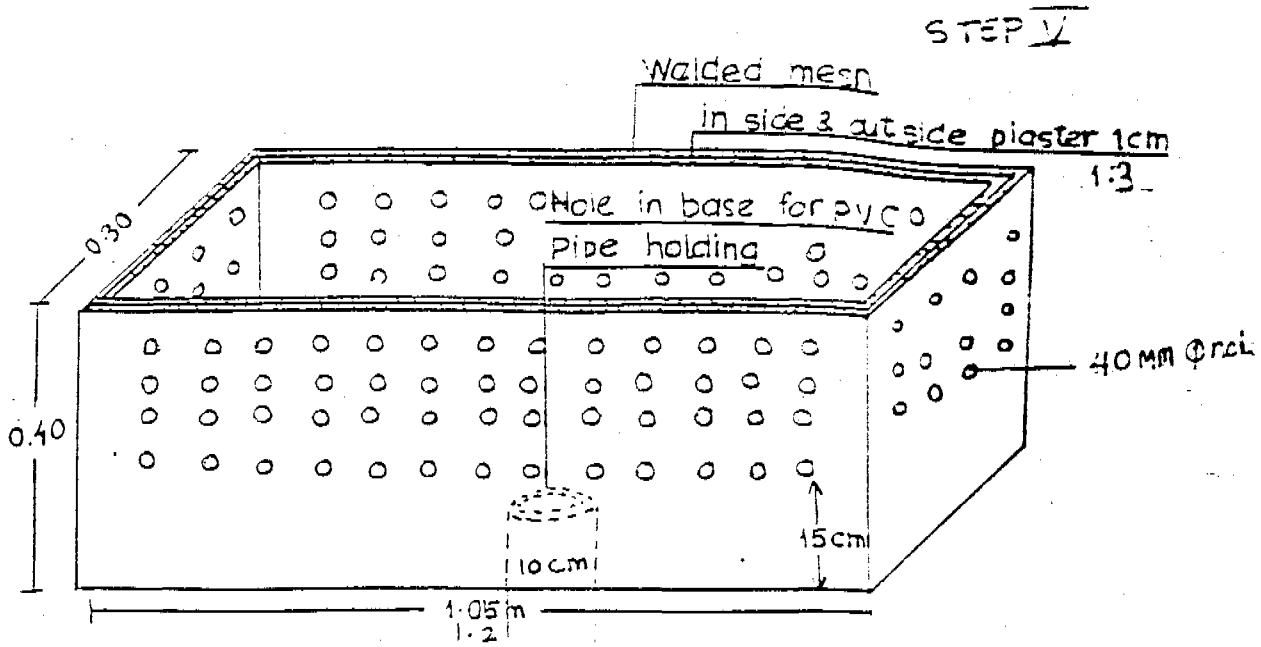
1. Remove newspapers without damaging the plaster on the inside wall
2. Plaster the outside wall with extra care. Total thickness of aeration chamber is about 20 to 25 mm. Leave for at least eight hours.
3. Pull out the PVC pipes.
4. Allow to cure for seven days by sprinkling with water and covering with wet jute bags or even leaves.

Material :

1.	Wire mesh	-	1.4 sq mtrs
2.	Cement	-	1/2 Bag
3.	Sand	-	2 Bags
4.	PVC TUBE 8 MM dia	-	15 mts

Labour Required :

Mason	-	2 days
Helper	-	2 days



AERETION CHANNEL OR CHAMBER

STEP VI PLASTERING OF THE TANK WALL :

- Cut the wire mesh and place vent pipe and outlet pipe at desired location
- Tie old newspapers around the skeleton cage, with a string
- Pack plaster (1:3) from the inside of the cage about 20 cm thick
- Allow to set for twentyfour hours

Next Day :

- Remove newspapers, without disturbing the plaster on the inner wall
- Plaster outside wall
- Total thickness of tank wall 30 to 35 mm. Leave overnight for setting
- Cure for ten days by filling the tank with water and covering with jute bags or leaves

Material :

1.	Cement	-	2 Bags
2.	Sand	-	6 Bags
3.	Pipe for outlet	-	1 No.
4.	Pipe for vent	-	1 No.

Note :

i) Vent pipe to be placed approximately 5 cm from the top edge.

ii) The outlet pipe to be placed, leaving 0.10 cm from top edge of tank. Elbow bends and top to be provided such that 50 cm clear space is available between bucket and tap.

Labour Required :

Mason	-	1 for 2 days
Helper	-	1 for 2 days

STEP VII CASTING THE LIDS :

- The lid is cast in three parts - two semi-circular section for the tank and one rectangular section for the aeration chamber
- Provide reinforcement, as per design
- Plaster with mortar (1:3:6) thickness of plaster 20 mm
- Make a hole of the required size for inlet of pipe in the second lid
- Allow to cure for seven days by sprinkling water and covering with jute bags or leaves

Material :

1.	Steel bar - 6 mm	-	22 m
2.	Cement	-	0.5 bag
3.	Sand	-	2.0 bag
4.	Stone chips	-	3.0 bag

Labour Required :

Mason	-	1 day
Helper	-	1 day

STEP VIII CONSTRUCTION OF PILLAR AND WASH OUT CHAMBER

- Brick Pillar Size 0.25 x 0.25 x 0.40 mt in cement mortar (1:4) and plastered in cm. (1:3)
- Wash out chamber below ground level size 0.75 x 0.60 x 0.60 with brick masonry in cm. (1:4) and plastered in cm. (1:4)

Material :

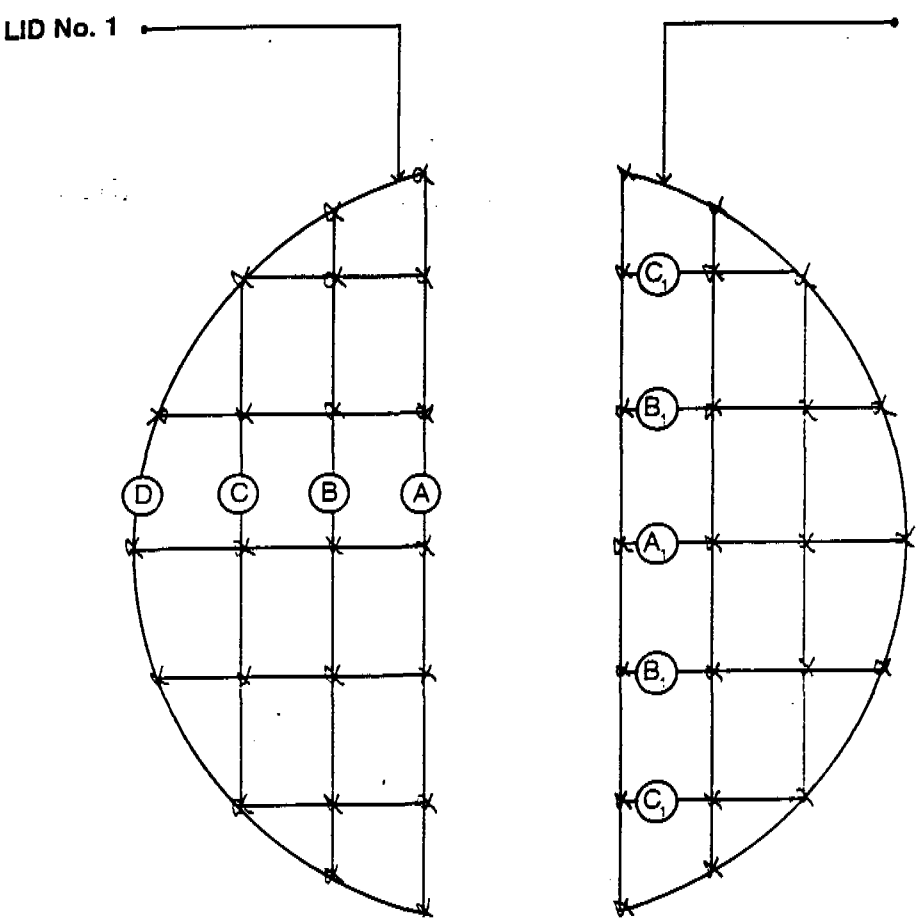
1.	Cement	-	1 bag
2.	Sand	-	3.50 bags
3.	Brick	-	100 Nos.

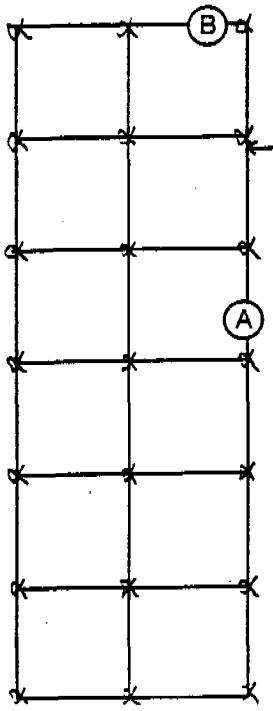
Labour Required :

Mason	-	1 No. 1 day
Helper	-	1 No. 1 day

DETAILS OF STEEL BAR FOR LID

STEP - VII





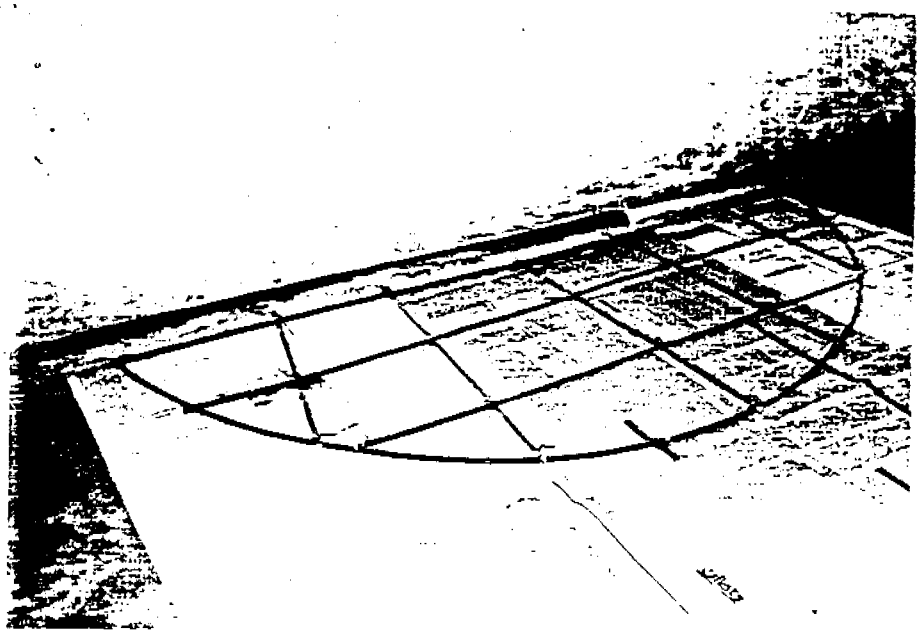
LID No. 2

LID 1

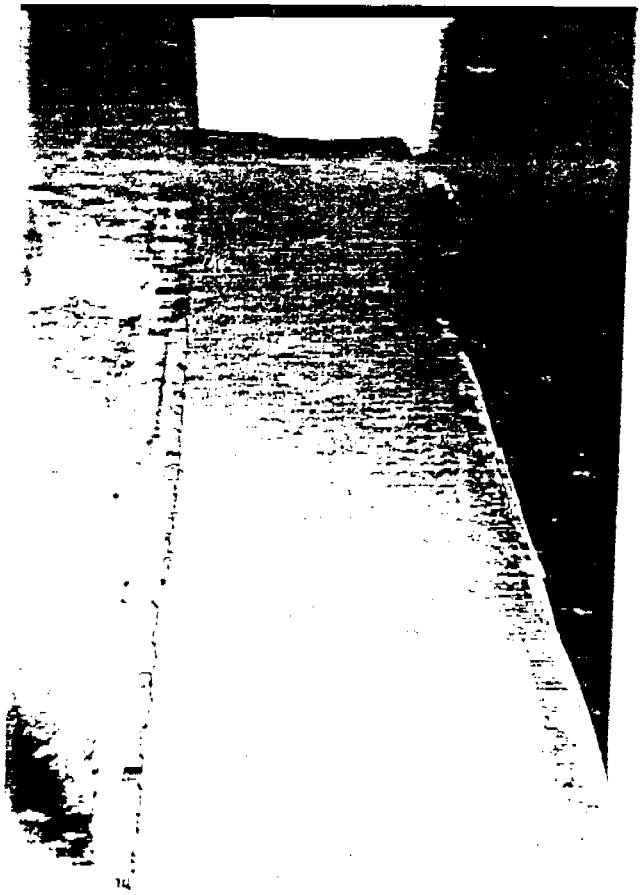
A	2	Nos.	1.17 each
B	2	Nos.	1.02 each
C	2	Nos.	0.73 each
D	2	Nos.	1.55 each
A1	2	Nos.	0.44 each
B1	4	Nos.	0.40 each
C1	4	Nos.	0.32 each

LID No. 2

A	3	Nos.	1.18 m each
B	9	Nos.	0.33 m each



Reinforcement for Semi Circular Coved

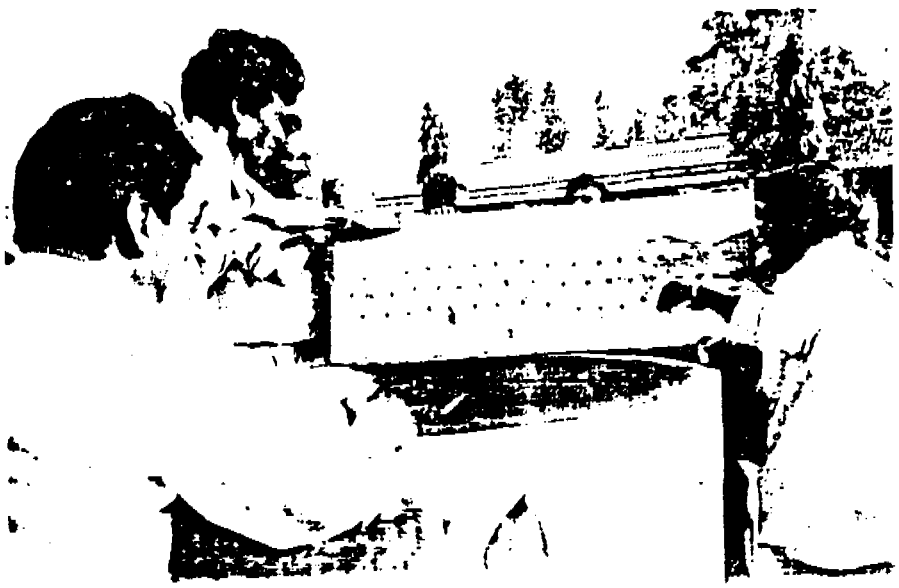


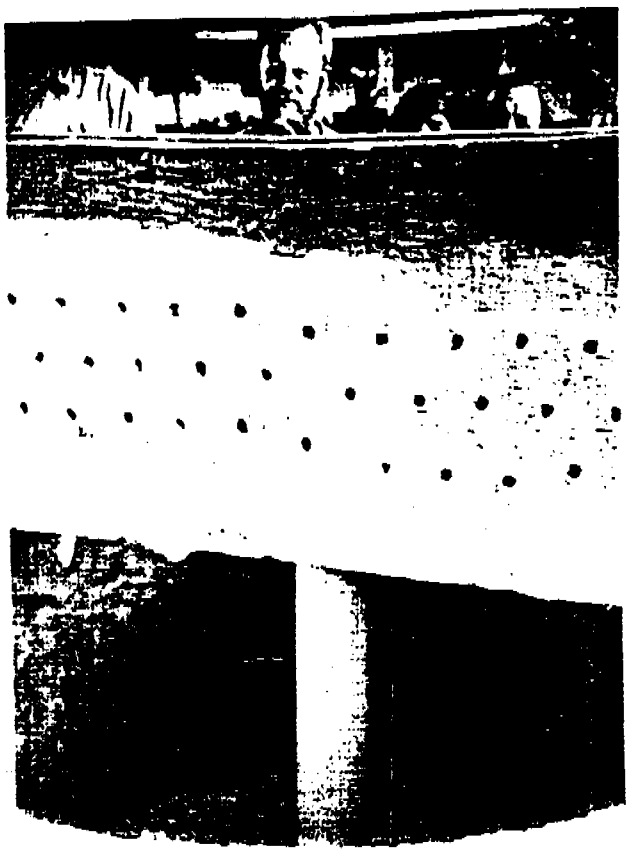
Cover Lid of aeration chamber with hole for delivery pipe from hand pump

Plant Assembly

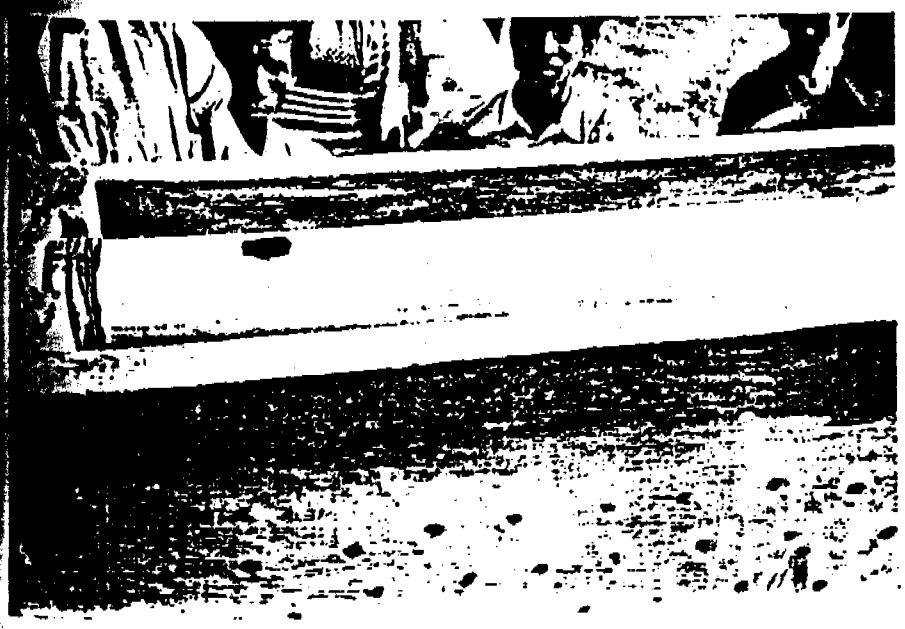
Assemble the plant by the following steps :

1. Lower the perforated slab into the tank till it rests on the projected surface.
2. Now place :
   10 cm thick layer of boulder 10 mm - 12 mm size
   20 cm thick layer of gravel - 6 mm - 8 mm size
   10 cm of coarse sand > 3 mm
3. Place aeration chamber over the tank





4. Fix the down take PVC pipe to the base of aeration tank



5. Place a row of pebbles on the chamber and then fix the PVC pipe such that the slotted section is on the lower end.

6. Cover with lids

(B) RECTANGULAR TYPE

Tank size : Length - 1.705 m (outside)
Width - 0.995 m (outside)
Height - 1.05 m

Rectangular 1RP consists of two tanks

(i) Settling tank of size 0.925 m x 0.675 m x 1.05 m

(ii) Filter tank of size 0.925 m x 0.925 m x 1.05 m

The construction of rectangular ferrocement iron removal plant requires 10 days. The step by step construction procedure is given below :

Step-I : SKELETON CAGE WITH MESH FRAMEWORK

- 6mm steel rods to be cut and bent as per sketch I and sketch II.
- Place rings at a spacing of 0.26m.
- Tie the welded mesh and fold in the excess mesh at the base.

Materials :

1.	Steel bar (6mm dia M.S. rod)	-	66.0 m
2.	Tying wire	-	1.0 kg
3.	Welding mesh 18 gauge (13mm)		
	(i) Side wall & inside wall	-	7.46 sq.m.
	(ii) Bottom slab	-	2.00 sq.m.
	(iii) Overflow chamber	-	0.72 sq.m.
			10.18 sq.m.

Labour required :

Bar-bender / mason - 1 No. for 1 day
Helper - 2 Nos for 1 day

Step-II : FOUNDATION AND BASE CASTING

1. Clean the site and level the surface.
2. Mark the site with lime powder of size 2.30 m length x 1.80 m width.
3. Dig the rectangular area as marked upto a depth of 0.75 m.
4. The brick khaoas will be laid including watering & well rammed for a size of 1.905m x 1.195m x 0.16 m depth.
5. Now the bricks will be placed as shuttering of 1:2:4 concrete with cement, sand & stone chips of size 1.905 m x 1.195 m.
6. The concrete of 1:2:4 with 6mm size stone chips will be laid up to a thickness

of 4cm with bottom size of 1.905m x 1.195m. Then the skeleton cage will be placed over the first layer and the remaining concrete (1:2:4) will be placed on the base of skeleton, about 3cm in thickness for bottom size of 1.805 m x 1.095 m. Then the 2nd day work will be over and the concrete is allowed to set for at least eight hours.

Materials :

1. Cement - 1 bag (50 kg)
2. Sand - 0.07 cum
3. Stone chips - 0.14 cum

Labours Required :

Mason - 1 No for 1 day
Helper - 2 Nos. for 1 day

Step-III : PROJECTION FOR RESTING FILTER PLATE

- Make a mould with bricks by placing vertically on the inside of the skeleton cage, leaving 8cm between the cage and edge of brick upto a height of 25cm.
- Cut the mesh and place the drain pipe with blank flange both the filter tank and setting tank.
- Fill the concrete (1:2:4) inside, between the brick mould and the skeleton wall.
- After two hours, the bricks will be removed.
- Cut the wire mesh and place the vent pipe and outlet pipe at desired location.
- Tie old newspaper around the skeleton cage with jute rope.
- Pack the paster (1:3) from the inside of the cage of filter chamber only.
- Allow to set for one night.

Materials :

1. Cement - 1 bag (50 kg)
2. Sand - 0.10 cum
3. 1" Scocket for outlet - 1 No.
4. 1" Socket for vent - 1 No.
5. Stone chips - 0.16 cum

Labour Required :

Mason - 1 No. for 1 day
Helper - 2 Nos for 1 day

Step-IV : INSIDE PLASTERING OF THE TANK WALL

- Pack the plaster (1:3) from the inside of the settling tank.
- Remove the brick shuttering of the projection for filter plate.
- Plastering and punning of filter tank inside.

Materials :

1. Cement - 1 bag (50 kg)
2. Sand - 0.10 cum

Labour Required :

Mason - 1 No. for 1 day
Helper - 2 Nos for 1 day

Step-V : FINISHING OF SETTLING TANK INSIDE AND OUTSIDE PLASTERING OF TANK WALL

- Plastering and punning of inside of settling tank.
- Remove the old newspaper from the tank wall.
- Pastering of outside short wall of filter tank.

Materials :

1. Cement - 3/4 bag (37.5 kg)
2. Sand - 0.08 cum

Labour Required :

Mason - 1 No. for 1 day
Helper - 2 Nos for 1 day

Step-VI . : PLASTERING OF REMAINING PORTION OR OUTSIDE TANK WALL

- Plastering with cement mortar (1:3) of the two long walls and one short wall.

Materials :

1. Cement - 1.25 bags (62.5 kg)
2. Sand - 0.15 cum

Labour Required :

1. Mason - 1 No. for 1 day
2. Helper - 2 Nos for 1 day

Step-VII : CONSTRUCTION OF BRICK PILLAR FOR OUTLET PIPE AN WASHOUT CHAMBER

- Construction of brick pillar of size 0.25 m x 0.25 m x 0.45 m height including plastering.
- Construction of brick masonary wash out chamber of size 0.75 m x 0.60 m x 0.60 m height including plastering. This includes the following items.
  (a) Earthwork excavation
  (b) laying of bricks inside the earthwork.
  (c) casting of 1:2:4 concrete
  (d) brick work and plastering

Materials :

1. Cement - 1 bag (50 kg)
2. Sand - 0.15 cum
3. Brick - 100 Nos

Labour Required :

1. Mason - 1 No. for 1 day
2. Helper - 2 Nos for 1 day

Step-VIII : INSIDE PLASTERING OF AERATION CHANNEL ROD BENDING & BINDING OF LIDS AND FILTER PLATE

- Cut and bend the wire mesh into 0.40m x 0.30m x 0.40 m
- Cut one 6mm dia rod of length 3.94 m around the top of the wire mesh of size 1.67m x 0.30m.
- Place the 110mm PVC pipe. Mark the size and cut a hole in the bottom of the channel.
- Tie the old newspapers around the framework.
- Pack the plaster with cement mortar (1:3) from inside of the framework.
- Allow to set for two hours.
- Cut and insert PVC pipes for making holes on both sides of the aeration tank.
- Leave it for one night.
- During the two hours idle period. the rods for lids is to be cut and tied with binding wire. (As per the Fig. 4)
- Cut the 6mm M.S. rods for perforated plate for filter media with required dimension (As per Fig. 3) and tie them with binding wire.

Materials :

1.	Wire mesh	-	2.36 sq.m
2.	Cement	-	0.50 bags (25 kg)
3.	Sand	-	0.08 cum
4.	PVC tube of 8mm dia	-	15 mtrs
5.	6mm dia M.S. rods	-	44.0 m

Labour Required :

Mason - 1 No. for 1day

Helper - 2 Nos for 1 day

Step-IX : OUTSIDE PLASTERING OF AERATION CHAMBER AND PREFABRICATION OF OVERFLOW CHAMBER

- Remove the old newspapers without damaging the plaster on the inside wall.
- Plaster the outside wall with extra care. Total thickness of the aeration chamber is about 20 to 25 mm. Leave for at least eight hours.
- Pull out the PVC pipes from the side of aeration tank.
- Allow to cure for seven days by sprinkling with water and covering with wet jute bags.
- Cut the wire mesh for overflow chamber in 'L' shaped with dimensions 0.25m x 0.25m x 0.90m height.
- Pack the plaster with cement mortar (1:3) on one side of the overflow chamber and leave it for one night.

Materials :

1. Cement - 1 bag (50 kg)
2. Sand - 0.10 cum
3. Wire mesh for overflow chamber - 0.60 sq.m

Labour Required :

1. Mason - 1 No. for 1 day
2. Helper - 2 Nos for 1 day

Step-X : CASTING OF LIDS AND PERFORATED PLATE FOR RESTING FILTER MEDIA AND FINISHING OF OVERFLOW CHAMBER

LIDS - The lid is cast in two parts

- One rectangular of size - 1.705 m x 0.36 m for aeration chamber
- Another also rectangular of size - 1.705m x 0.635m for the coverage of tank.

- Place reinforcement.
- Cast in cement concrete (1:2:4) with 6mm stone chips. Total thickness after plastering will be 50 mm.
- Allow to cure for 7 days by sprinkling water and covering with jute bags.

PERFORATED PLATE :

- Place the reinforcement.
- Cut the wire mesh (20mm size) of size 0.82m x 0.82m.
- Place the wire mesh over the framework of reinforcement.
- Cut about 120 pieces of 50mm length of pipe of dia 15 mm.
- Embed pipe in the wire mesh.
- Mix 1:3 cement mortar and apply 50 mm thick layer on the entire ring. Avoid filling of the tube.
- Fix two handle in the slab.
- Allow to cure for 7 days by sprinkling and covering with wet gunny bags.

OVERFLOW CHAMBER :

- Finishing the overflow chamber in cement mortar (1:3) including punning.

Materials :

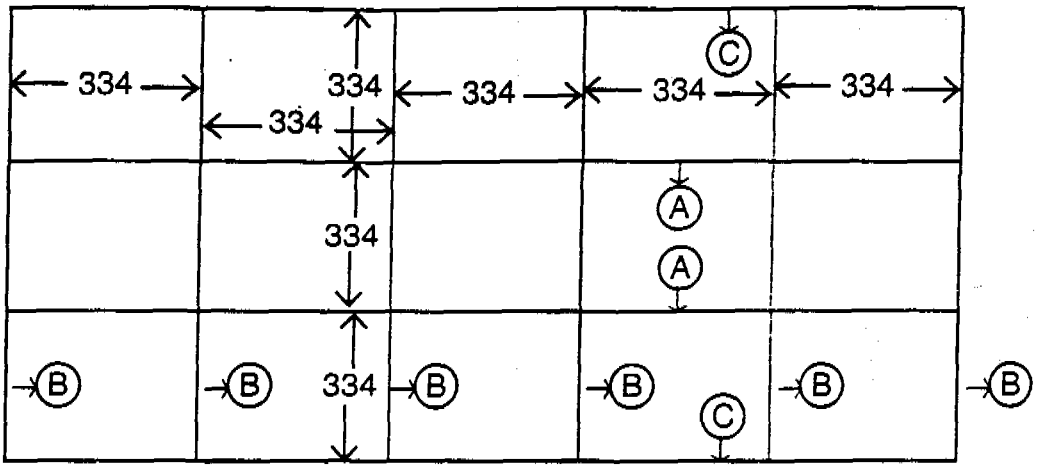
1.	Wire mesh	-	0.81 sq.m.
2.	PVC tube	-	6.0 m
3.	Cement	-	1.5 bags (75 kg)
4.	Sand	-	0.17 cum
5.	6mm stone chips	-	0.10 cum

Labour Required :

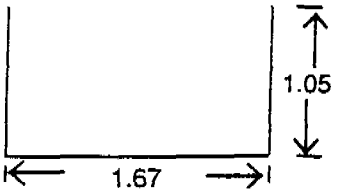
Mason	-	1 No. for 1 day
Helper	-	2 Nos for 1 day

FIG. 1(a)

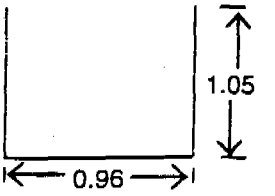
SKELETON CAGE WITH REINFORCEMENT DETAILS



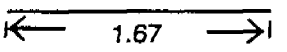
Ⓐ Base & wall - 2 No 3.77 m each



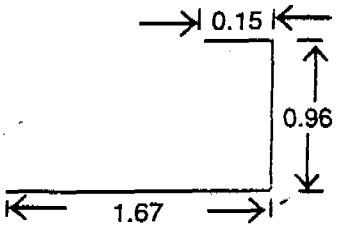
Ⓑ Base & wall - 6 No 3.06 m each



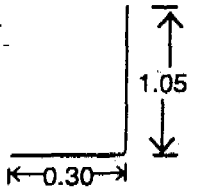
Ⓒ Base - 2 No 1.67 m each



Ⓓ Ring in wall - 8 No 2.78 m each



Ⓔ Partition wall vertical Rod - 4 No 1.35 m each



Partition wall Horizontal Rod - 4 No 1.11 m each

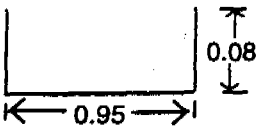


FIG. 1(b)

CROSS SECTION OF SKELETON CAGE

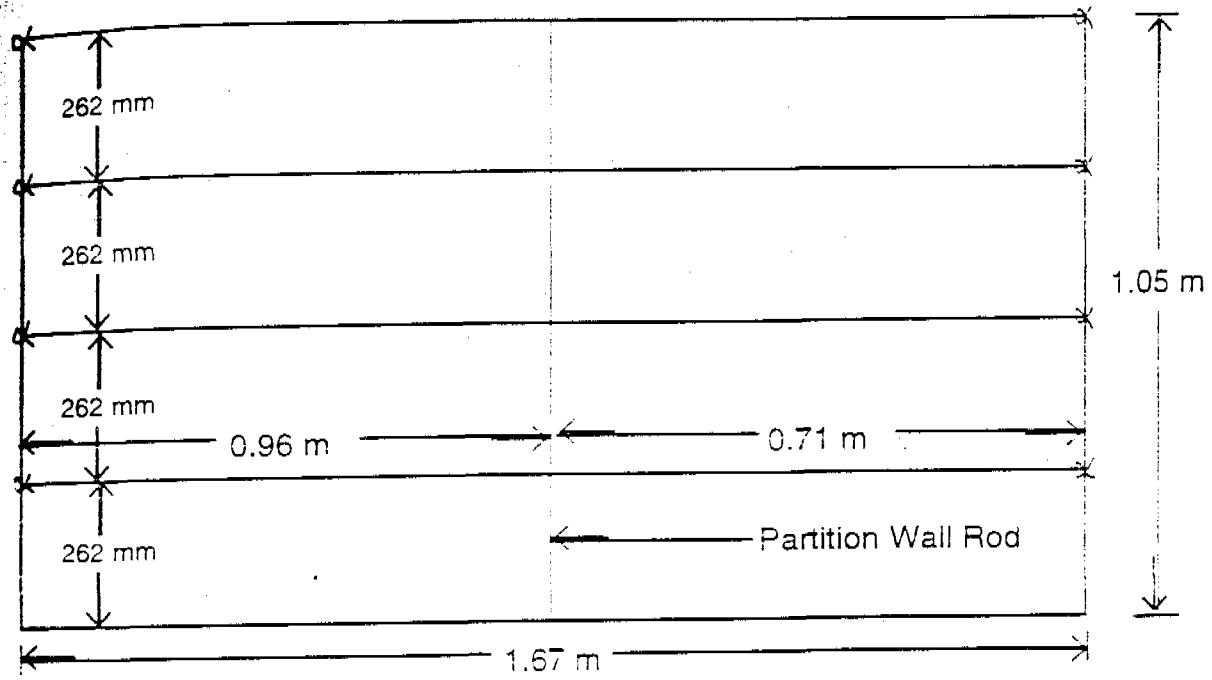


FIG. 2

AERATION CHANNEL OR CHAMBER

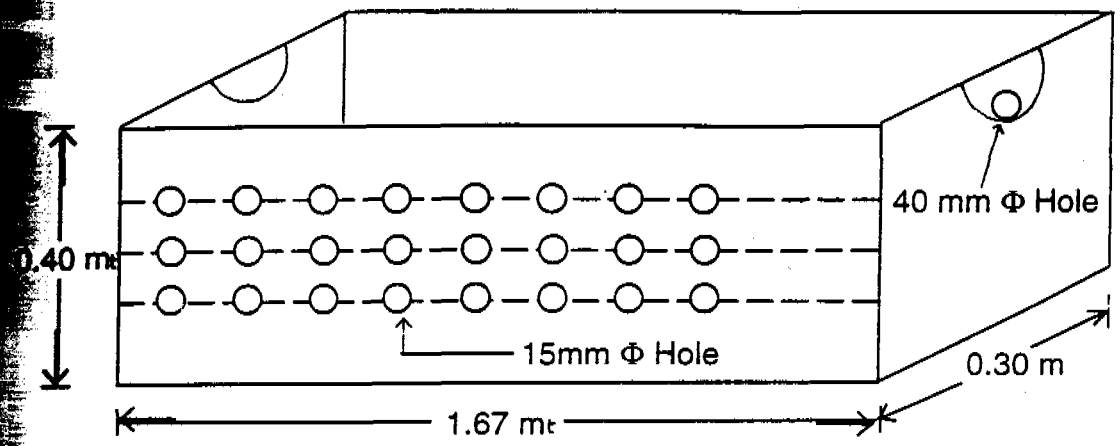
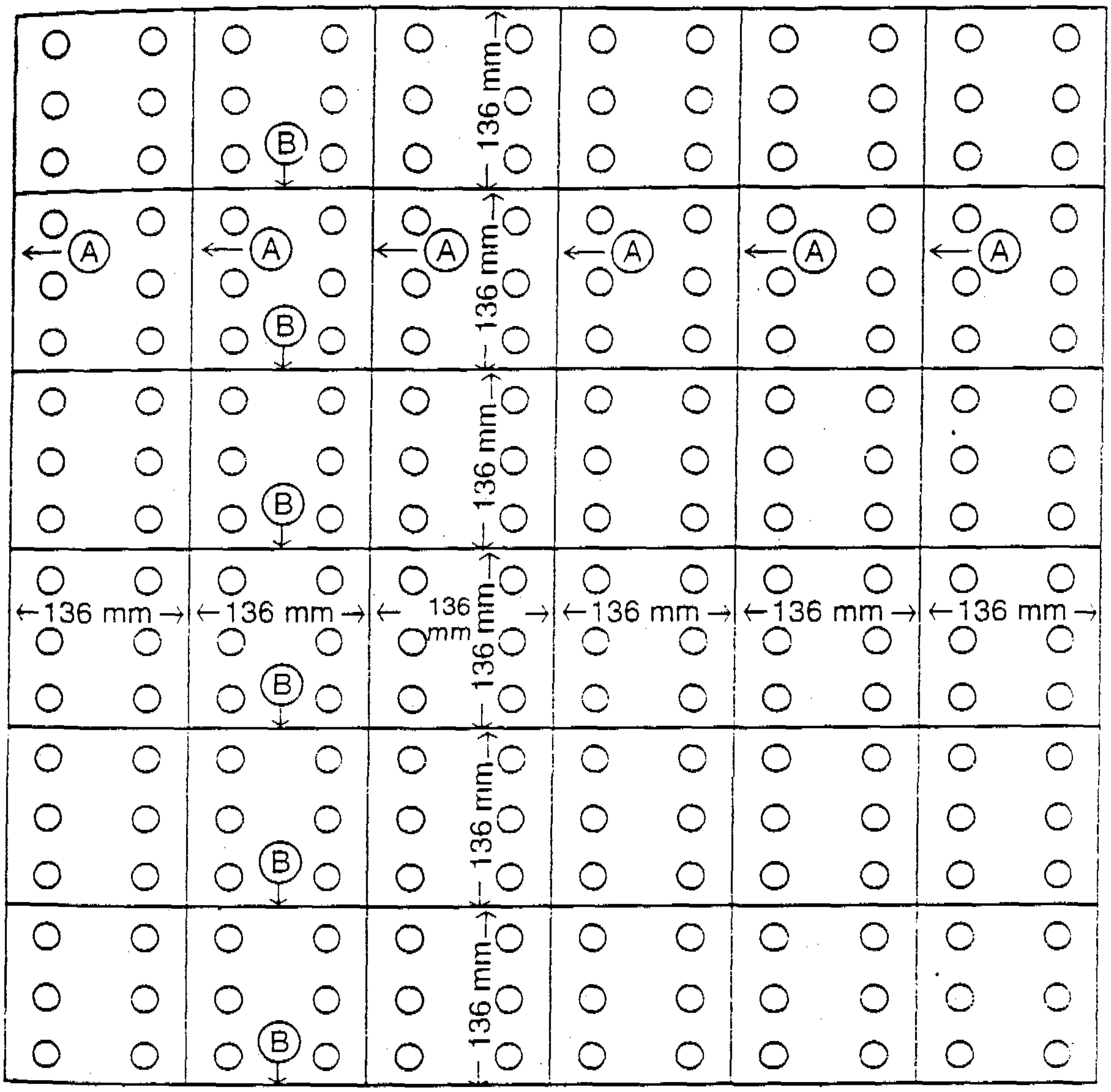


FIG. 3

PERFORATED PLATE FOR FILTER MEDIA BASE

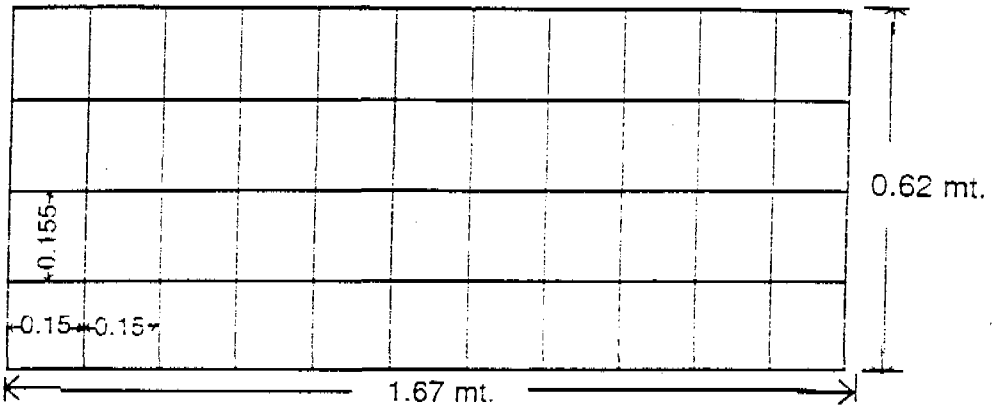


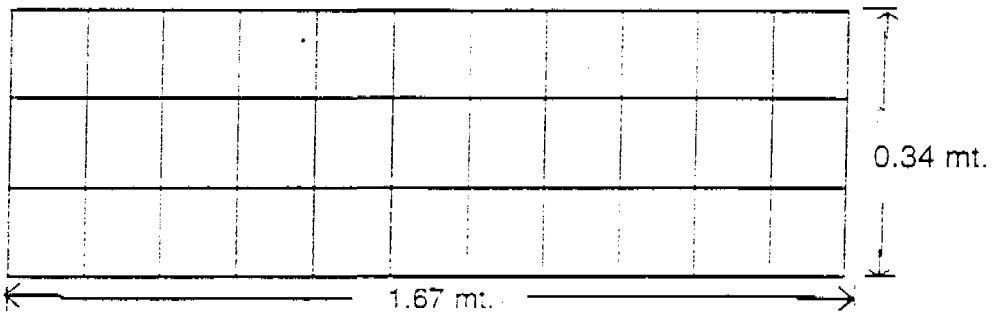
Ⓐ 6 mm Rod - 7 No 0.82 mt each

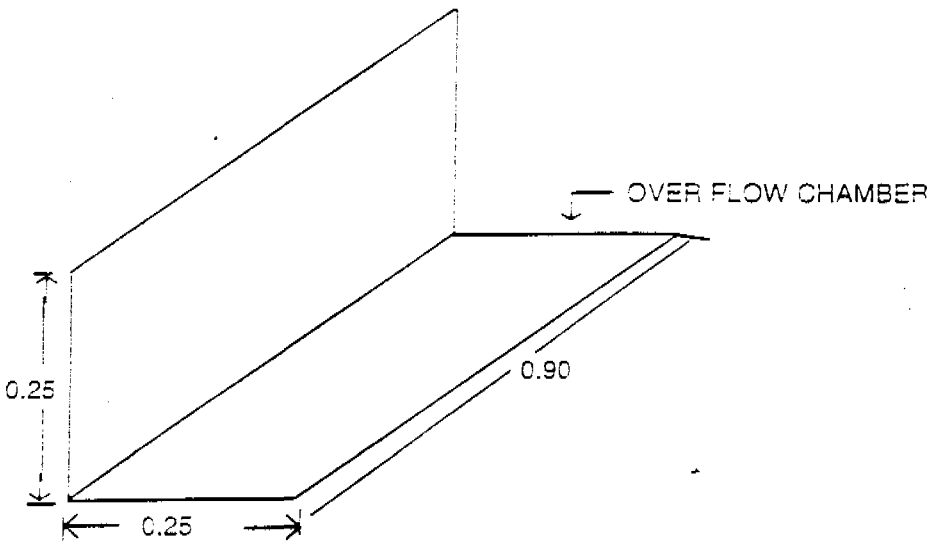
Ⓑ 6 mm Rod - 7 No 0.82 mt each

FIG. 4

LID FOR TANK







(V) OPERATION

The operation of the iron-removal plant is based on the following principles :

- trickling aeration
- pre-setting
- sedimentation
- up-flow filter

Water from the handpump is fed directly to the PVC aeration pipe by force lift ngement. This is achieved by modifying the water tank and providing gland packing 'O' rings. Aeration is achieved by passage of water through the slots of the aeration and then over a bed of pebbles in the aeration tray. Passage of water through slots eases the surface area of the water accelerating the rate of oxygen absorption. bsequent passage of water over a bed of pebbles in the aeration tray acts like trickling d aeration.

The aerated water moves to the bottom of the pre-setting chamber through a PVC pe. Here the oxidation reaction is completed and the oxidised particles settle under quiescent condition. The settled water passes through a bed of gravel and coarse sand the upward direction. The ferric particles either settle at the base of the tank or will get ntrapped in the filter media.

Clear water after filtration is collected over the media and is made available to the consumer, through an outlet.

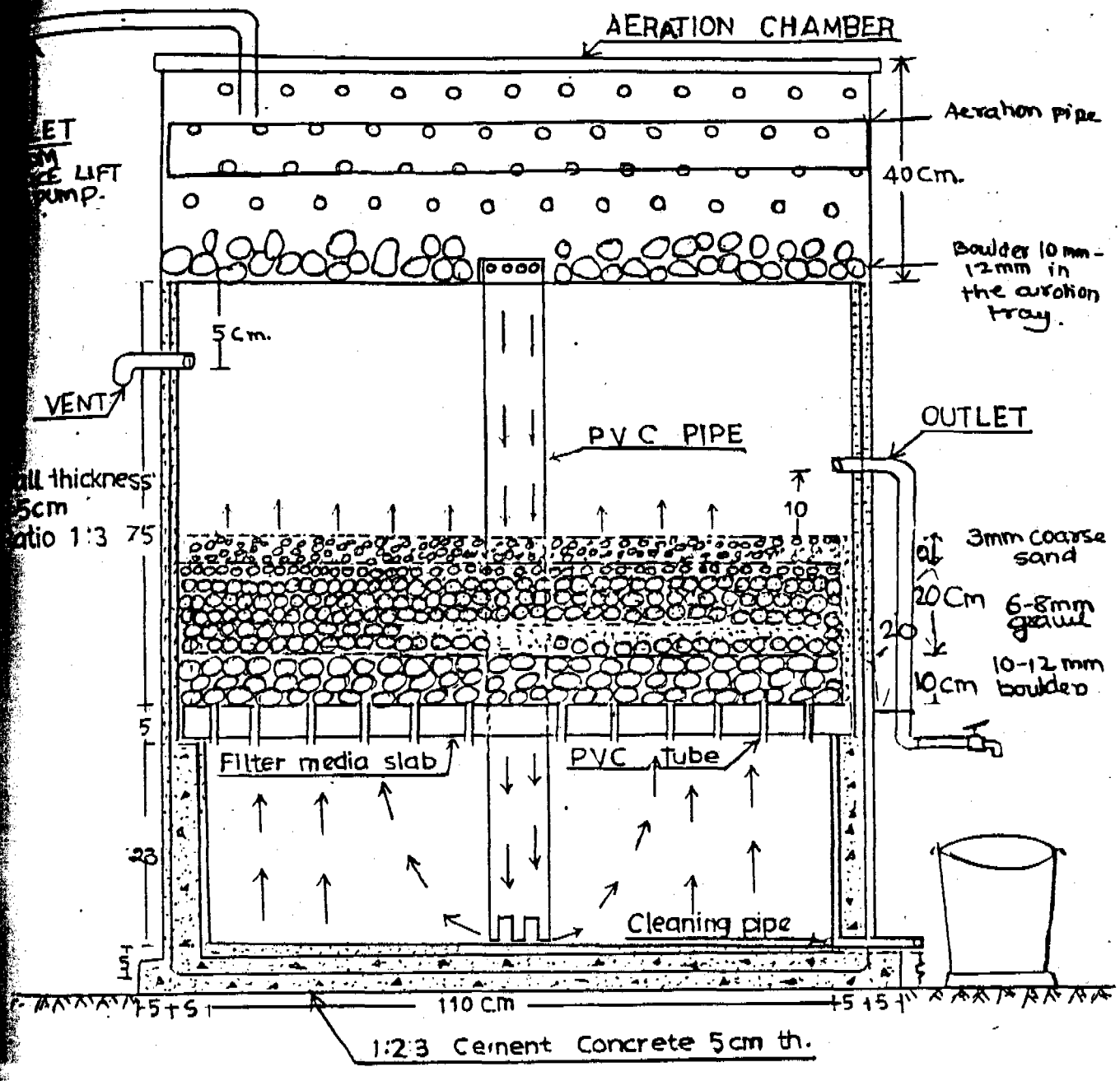
(VI) MAINTENANCE

To ensure that the iron-removal plant works effectively, periodic back-washing would be required. Even though the iron level at the outlet of the filter remains within the acceptable limit of 1 mg/l the general filter condition and head are considered for fixing a two month interval for backwash.

During the back washing of the settling tank, the aeration chamber is cleaned by removing the lid and pebbles, washing the pebbles and replacing them in the chamber. The back-washing of the main unit is done by closing the clear water outlet and pumping water into the plant. till it starts to over-flow from the vent. Open the flange on the drain-pipe and the head of a column of 400mm of water over the filter bed and the diameter of the back-wash outlet creates a high back-wash rate for cleaning the trapped iron-oxides from the media and scouring the settled matters from the settling basin. This process is done 2/3 times, consecutively. The filter media can be taken out, cleaned and replaced. This operation may be required once in two years or so. Other than back-washing, the plant has virtually no maintenance need. The labour component for back-washing is 3/4 hours every two months.

Community participation is the key factor for the success of I.R.P. implementation programme. Social mobilization should be the primary and integral part of this programme.

The handpumps to which the IRP's would be attached, should have a community based maintenance system and there needs to be a clear prior understanding that the same beneficiaries would be responsible for the maintenance of the IRP, with guidance from experts, as and when necessary.



DETAILS AND SECTION PLAN OF FERROCEMENT TANK

G
G
L
BRICK KHOA
C.C C1:2:4)
C.C C1:2:4)
1.905M
1.805m
1.705m
0.16
0.03
0.04
0.80
0.25
0.05
0.10
0.20
0.48
0.15
0.10
0.30
0.38
0.11
0.05
0.90
0.05
0.35