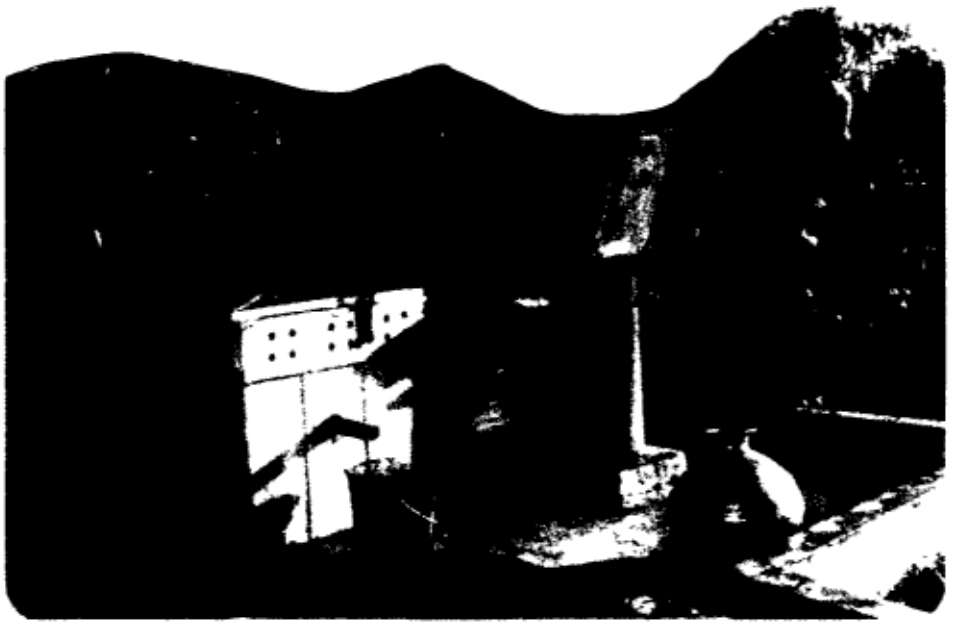
UNITED NATIONS CHILDREN'S FUND

IRON REMOVAL PLANT

INSTALLATION AND MAINTENANCE MANUAL



CONTENT

WATER AND SANITATION SECTION

UNICEF

COLOMBO

APRIL 1987

IRON REMOVAL PLANT

1. Features

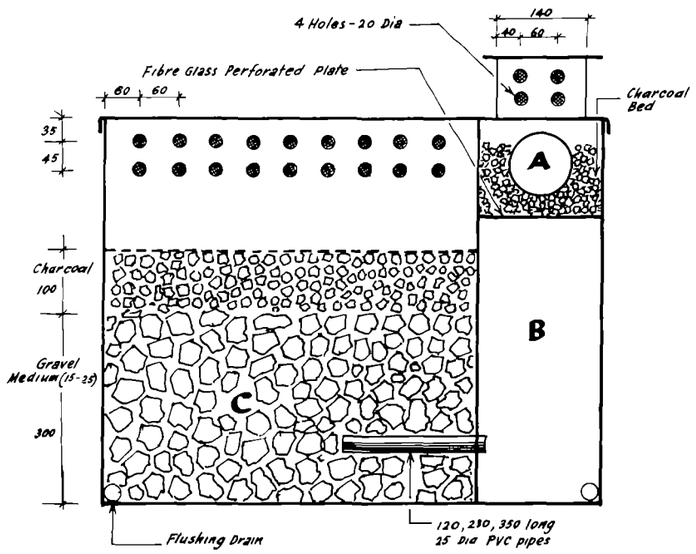
The natural ground water in tube wells (shallow and deep) contain dissolved gases (Co_2 , O_2) as well as dissolves solids (iron, nitrates, sulphates, calcium, magnesium, fluorides). The composition of these dissolved gases and solids in a given location, however, varies with hydrogeological factors.

The most common problem encountered in Sri Lanka is the presence of iron in the ground water vhich affects both taste and colour. Consequently, the villagers reject water from such wells. Although the ground water may have a high natural iron content (more than 1 mg/L), the excess iron is not harmful for human consumption (the WHO optimum limit is 1 mg/L). The problem is essentially that of acceptancy which varies from area to area. In water scarce areas, people drink water with a high natural iron content of more than 3 mg/L. In water available areas however, people reject water even with iron 1.1 mg/L and opt for the polluted surface water which they are accustomed to. Although water is plentiful in most of Sri Lanka (unlike India or parts of Africa), safe drinking water is not abundant; furthermore, the acceptancy of a 'rusty taste' is low at iron 1 2 mg/L.

This iron removal plant (IRP) is designed and developed to reduce the iron content in the ground water which is extracted through tube wells with handpumps. The IRP is not a normal filtration tank; instead it is an aeration, sedimentation, absorption and filtration system (vide attached drawings).

The water, pumped out by the handpump, flows through the aeration chamber 'A' and sprays outwatds through the slits. The water then passes through the charcoal bed thereby aerating it further. The water enters the sedimentation chamber 'B' where some sediments settle to the bottom. The water flows through connecting pipes to the bottom of the absorption chamber 'C'. The water flows upwards along chamber 'C' and will continue to do so as long as the water level in Chamber 'B' is higher than in 'C'. The gravel and charcoal in chamber 'C' absorb the gases dissoved in the water, filter the iron and other particles, and aerate the water while it flows upwards. The only solids which enter chamber 'D' are extremely fine particles in the form of floating solids, all of which are filtered in this chamber thus emitting clean drinking water from the outlet.

The IRP has to be cleaned and the charcoal and gravel replaced periodically. The life span of the filter depends on both the raw water quality and on the number of users. Community involvement is necessary to maintain the filter and ensure its performance. This manual describes the IRPs installation procedure and its maintenance, both at the community level. It is worth noting however that the IRP is recommended for removing low iron content (i.e. less than 8 mg/L).



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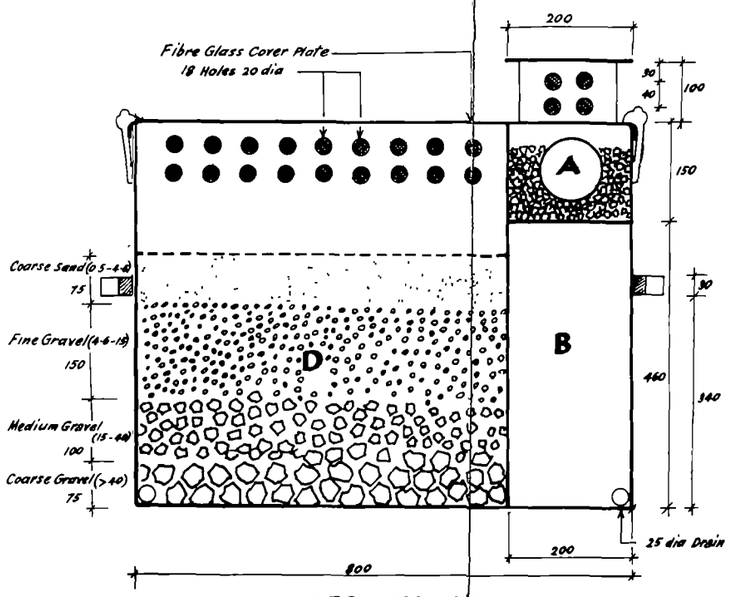

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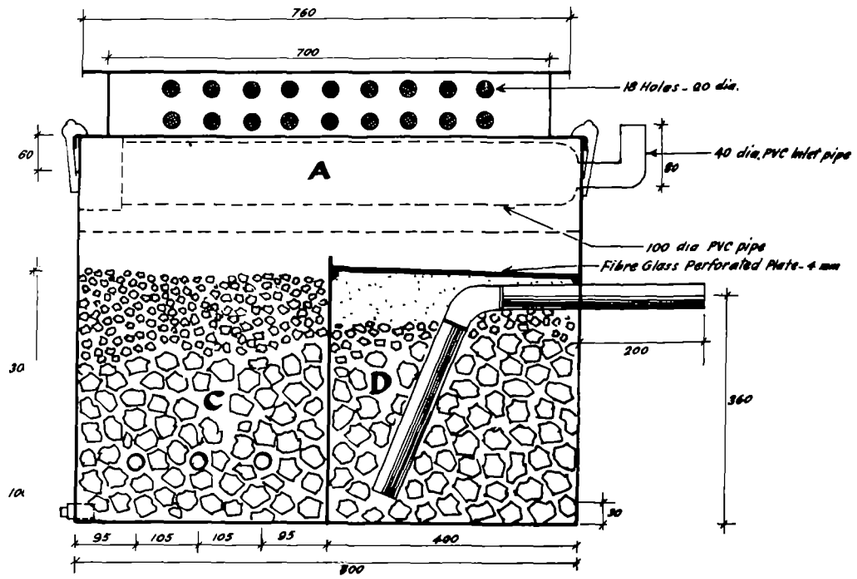

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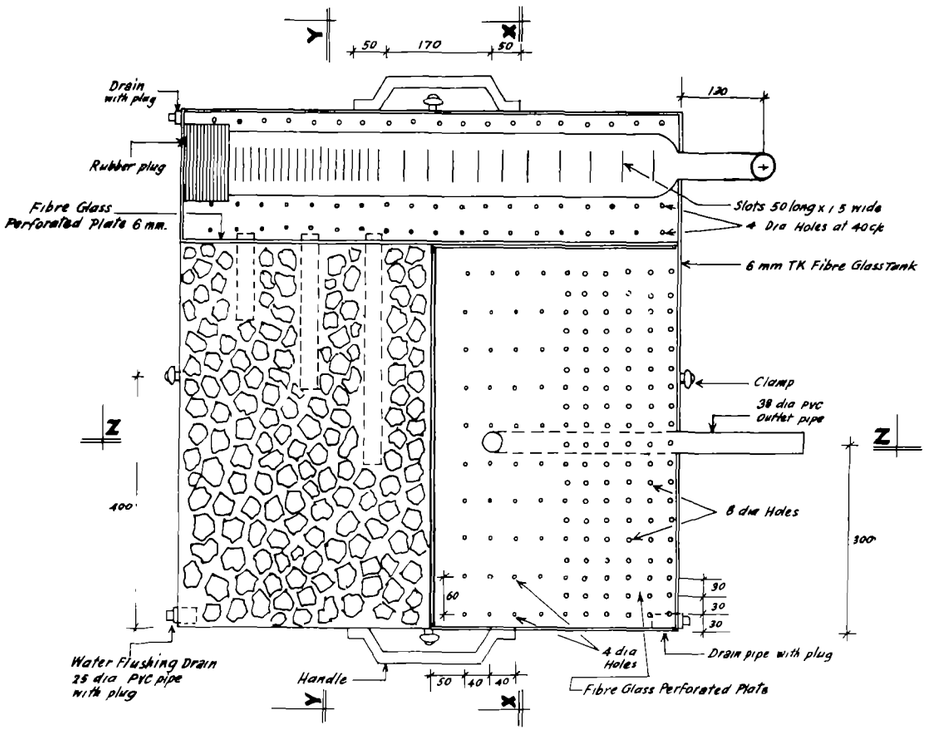

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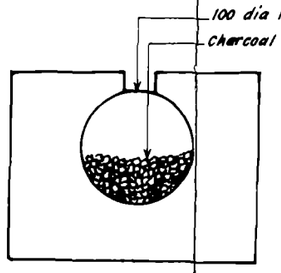


DETAIL AT A

A Aeration Channel

B Sedimentation Chamber

C Absorption Chamber

D Filtration Chamber

WORKING CONDITION :-

IRON CONTENT RANGE UPTO 8 PPM.

NOTES :-

- Size of charcoal should be 13-15 approximately.
- Plugs should be removed and chambers flushed with clean water approx. every 2 weeks. Top of filter 'D' should be discarded, and made with similar materials.
- The 100 dia. PVC pipe should be cut on the top with slots 50 c/c in the first third, 40 c/c in the middle third, and 10 c/c in the last third of the pipe measuring from inlet.
- All floors are to slope towards the outlet pipe.
- All 20 mm. dia. holes should be covered with PVC mesh.
- All dimensions are in millimeters.

UNICEF — COLOMBO
WATER AND SANITATION SECTION

COMMUNITY PACKAGE TYPE
IRON REMOVAL PLANT

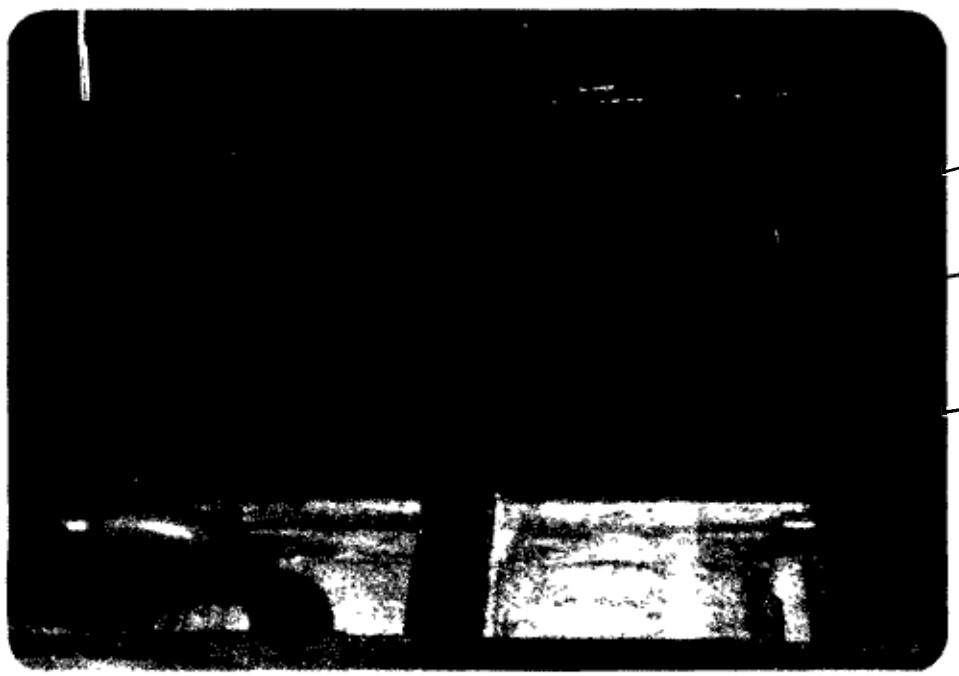
Dgn Adjt RAFAEL DIAZ DIAZ (Chief)		Tested AUNG CHEIN (P.O.)
Dwn P A MITHTHAPALA	Chkd AUNG CHEIN (P.O.)	Appd RAFAEL DIAZ DIAZ (Chief)
September 1986	Scale - 1:5	Drawing No WS/5

2. INSTALLATION OF IRON REMOVAL PLANT

(01) Level the ground and place the iron removal tank. If necessary, build up an elevated foundation block to keep intake pipe as close as possible to handpump spout.

(02) Clean inside the tank.

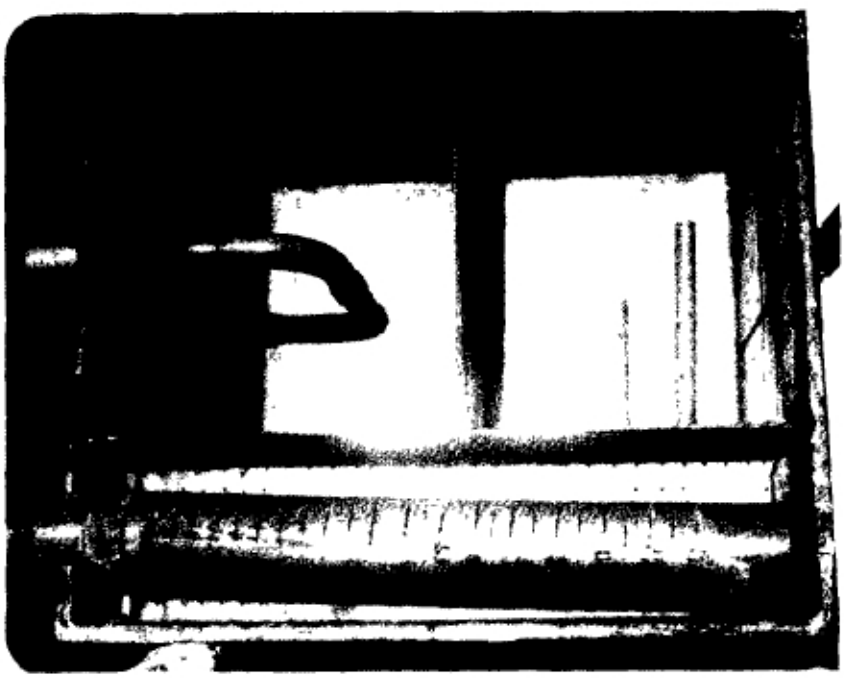
(03) Check marking lines on the inside walls of chamber (C) and (D).



(04) Select correct sizes of required materials and wash them with water thoroughly before filling in the tank.

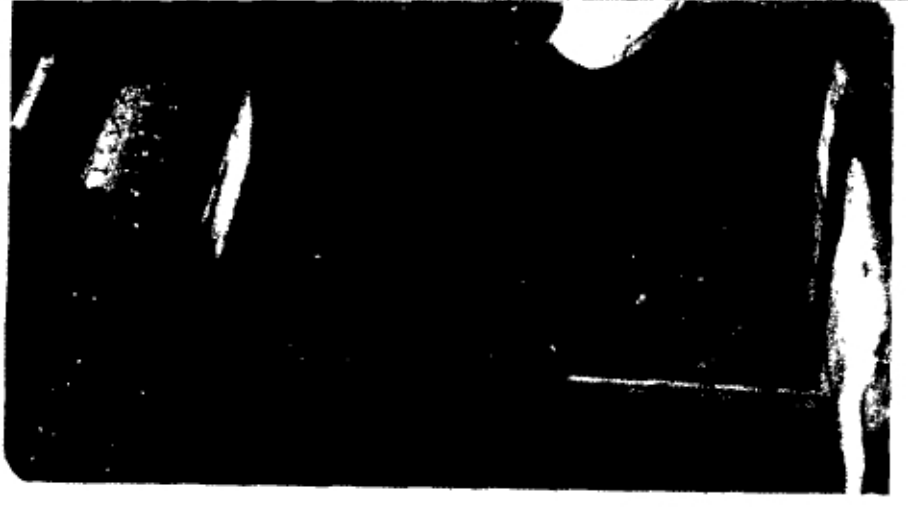
(05) Fill charcoal into the intake pipe and seal it with rubber cap.

(06) Place the intake pipe across the charcoal bed, keeping inlet port adjacent to pump spout, and adjoin pump spout and intake pipe.

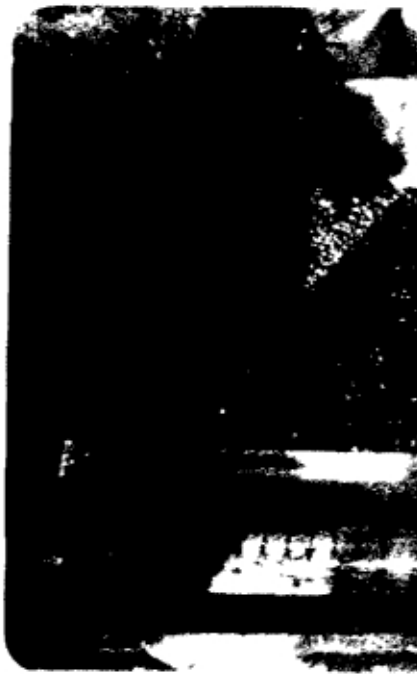


(07) Place correct kinds, sizes and amounts of materials in the chambers according to drawings

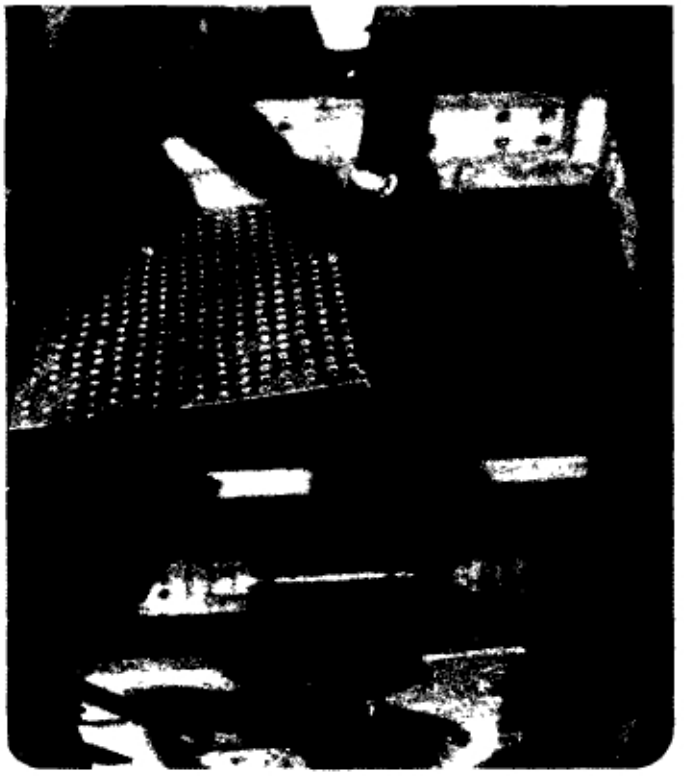
(08) Pour water on materials continuously while filling in the tank. Drains must be kept opened.



(09) Level the layers of materials in chambers and close all drains.



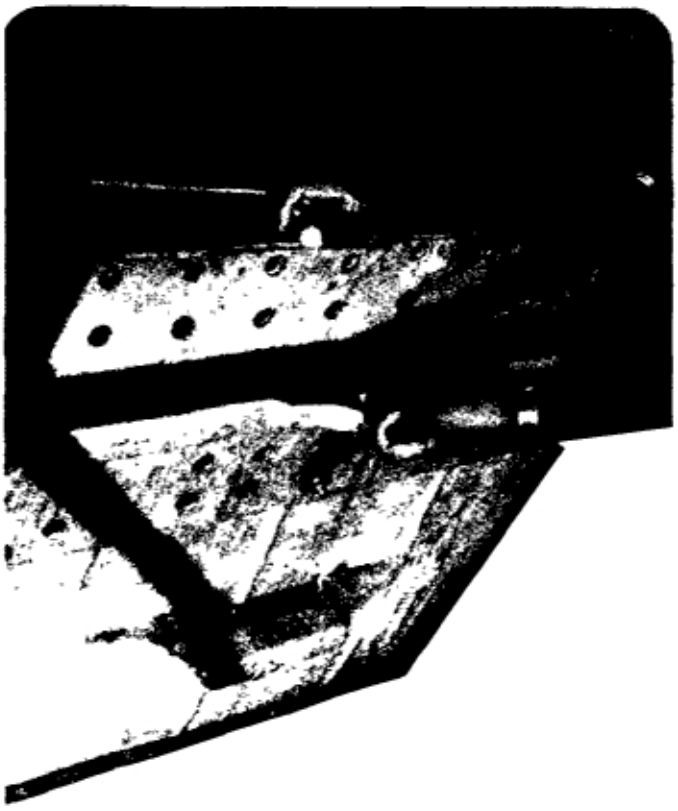
(10) Operate the handpump until water flows out from the tank outlet.



(11) Place the perforated plate on top of the chamber (D).

(12) Pump and flush out water from all drains. Clean chambers one after another until drained water is clear.

(13) Close all drains.



(14) Cover the tank and fasten the clamps.

(15) Pump out water through the plant until water is clear.

3. PROCEDURE FOR CLEANING IRON REMOVAL PLANT

(01) Remove the cover and pick out debris seen on layers of materials.

(02) Open 1st drain on sedimentation chamber (B).

(03) Operate the handpump continuously, flushing out the chamber (B), until drained water is clear. Then plug the 1st drain.

(04) Repeat samely on chamber (C) and (D), (i.e. 2nd and 3rd drain) Agitate the materials in chambers without breaking the layers, while flushing.

(05) Lastly, while pumping out water through the tank outlet, open all drains simultaneously and flush out all chambers

(06) Close all drains and replace the cover

The above steps of back-washing method are needed to be done perfectly and patiently. To gain long lasting efficiency of this plant, cleaning must be done once a month at least. Wherever a large amount of excess iron content exists in well water, this plant must be cleaned once a week.

Half yearly or if the iron removal plant is not functioning well even though the above back-washing has been done, take out all materials from the tank, wash them thoroughly and replace them properly. If it is still not functioning, change with new materials.

Note: (a) Be careful not to break the drain pipe when fastening or loosening the plug.

(b) Prevent children from stepping on drain pipes, breaking PVC mesh, throwing debris into tank, sitting on tank and removing parts from tank.

For further information contact.

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