

Resources Centre for Sustainable Development

Barrel Bio-sand filters

A Bio-sand filters housing can be made with a fresh cylindrical plastic drums or with the help of reused plastic barrels, which not only help in cost reduction but also makes the filter mobile and easy to handle compared to concrete filter housing material. The important aspect in the filter is to keep a sand column of at least 50 cm within the filter, to ensure proper filtration, underlain by 5cm of fine gravel and 5cm of coarse gravel at the base for adequate water storage, and keeping a constant 5cm layer of standing water above the sand layer for the bio-film development.

Materials for construction:

- drum x 1 (70 cm + diffuser bucket housing as applicable)
- 70 cm sections of 3/4" PVC pipe x 1
- 20 cm perforated intake candle
- GI Tank nipple 3/4" x 1
- Plastic socket 3/4" x 1
- Plastic Elbows 3/4" x 2
- Plastic Nipples 3/4" x 1
- Plumbing tape roll x 1
- A perforated plastic washbasin is used as diffuser plate
- A piece of plastic mosquito mesh to cover the intake pipe
- Plastic straps to fasten the plastic mesh
- A plastic tap to regulate water flow to avoid water contamination
- Select Diffuser bucket as per size of the drum overhead to be placed.



Tie the plastic mesh over the perforated intake candle located at the base of the barrel affixed to the vertical 70 cm pvc pipe to avoid sand & gravel pieces from entering the delivery pipe. Thereafter lay the 5 cm layer of gravel, followed by 5 cm layer of fine sand and 50 cm of coarse sand. Place the diffuser bucket with the base having a gap of 10 cm with the sand layer apex and use a lid to cover.

Operation & Maintenance

The Bio-layer

A fully mature bio-layer (*a green slimy coating on top of the sand*) is formed by about 30 days, without which the filter would remove 30-70% of the pathogens through mechanical trapping and adsorption, while the ideal bio-layer will increase the treatment efficiency up to 99% for pathogens removal.

The efficiency and the oxygen demand increases as the biolayer grows and hence it is essential to operated intermittently and consistently with a minimum of 1 hour after the water has stopped flowing up to a maximum of 48 hours. The pause period is important because it allows time for the microorganisms in the bio-layer to consume the pathogens in the water. If the pause period is extended beyond the prescribed limit, the microorganisms will eventually consume all the available nutrients and pathogens and eventually die.

Installation procedure:

Clean the drum thoroughly with water and detergent and sufficient sun drying.

Make a perforation at the barrel wall at a height of 70cm from the base. Attach the nipple-elbow-socket to the drum and affix the 70 cm PVC pipe in vertical position in the interior section.

Wash the sand adequately until complete clean water flow out from the sand on the final wash. Spread the washed sand in a clean sheet for adequate sun drying for disinfection.

Static water level

A static water level of 5 cm (2") above the bio-layer is recommended, while a water depth less than 5 cm (2") may quickly evaporate and dehydrate the bio-layer, checkout for higher water level beyond the 5 cm.

Service

With continual usage the opening between the sand grains in the filter column will become clogged with and result in low flow rate. On excessive low flow rate, the upper sand layer extending up to deep brownish depths may be scooped out and washed thoroughly, sun dried and replaced into the filter.

A installation guide video manual is available for reference at rcsdin youtube channel.

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