

Concrete
BioSand Water Filter
Construction Manual
Book 7: Installation and
Commissioning

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Before installation starts the filter must be located, indoors where it is convenient to use and won't be contaminated by animals, protected from the weather and protected from the play of little children.

Once the filter is located and installed it is very heavy and difficult to move. It is possible to remove the material from the filter in exactly the same way it was put in and re-install the filter again. This procedure is sometimes required when errors are made in the original installation.

1. Filter is located and leveled using a straight piece of wood and a pitcher of water.



Depth of Media

- **Underdrain: 8 cm. or more – MUST cover inlet to standpipe by 2 cm.**
- **Separating Media: 3 cm – MUST be uniform in depth to prevent fine material from entering underdrain media and plugging the standpipe.**
- **Filtering Media: 40 to 45 cm – Must allow at least 5 cm between top of media and bottom of diffuser basin to allow proper aeration of water.**

2. Placing underdrain gravel.



3. Leveling surface of underdrain media with hand.



4. Measuring thickness of underdrain media using a measuring stick.
 (See instructions on construction of measuring stick pages 9, 10 and 11.)



**If thickness of layer is too great some media will be removed.
 Similarly, if the thickness is too small media is removed.
 Measurements are taken after the surface of the media is leveled.**

5. Adding water (can be from untreated water supply). **Best through diffuser to avoid disturbing media!**
Except for the underdrain layer, media is always added to water to avoid trapping air bubbles and reducing flow capacity. 20 cm is sufficient.



- 6 – 10. Adding separation media



11. Adding filtering media.
Filtering media is added quickly to avoid separating into layers.



12. Adding more water to filter with diffuser basin in place.

13 - 15. Additional media placed in filter, leveled and checked again. This process is repeated as often as required
Volumes of media used should be carefully noted to make future installations simpler and allow future prepackaging or bagging of media.

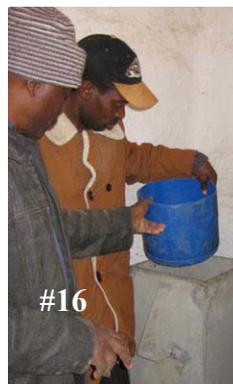


With use media will settle a little. Additional filtering media can be added to achieve required depth.



Water in filter will look very cloudy, 'dirty', or turbid during and immediately after the addition of the filter media. This is normal. The amount of turbidity will depend on the type of media used and the amount it was washed. The first step after all media is installed in the filter is to perform an initial cleaning.

16. After the filter is running clear it is cleaned. This is performed by adding water such that the top reservoir is about one-half full. The diffuser is removed. Using your hand or a brush the top



of the media is agitated (quickly). The fingers are just touching the media or entering it no more than 1 cm.

17 – 18. All of the captured material will be suspended in the water and it will become very cloudy. This water is removed from the filter using a ladle or cup. Once this process is completed the filter is ready for calibration or use.



This is the exactly the same cleaning process that is used when the filter is put into use.

After the initial cleaning is completed water must be poured into the filter to ‘flush’ all fine material. This process continues until the filter produces very clean water. Note that the filter can be flushed using untreated water.

DO NOT REUSE THE WATER FLUSHED THROUGH FILTER. THIS DOES NOT WORK. ALWAYS USE ‘FRESH’ OR ‘UNFILTERED’ WATER FOR FLUSHING.

At least 4 to 5 buckets (15 – 20 litres per bucket) will be required for flushing.

19 – 20. Locating diffuser.



21. Pouring water into filter to start flushing process.

Note that water level is kept as high as possible (near to the top) to get maximum flow.

22. Collecting filtered water in a clear glass.



23. Initially filtered water is very cloudy (turbid) but as flushing continues water will become very clear – more clear than the source water.



Calibration

The measurement of the flow through the filter is known as calibration.

The flow rate is determined using a 1 litre pop bottle and a watch with a second hand. The time it takes to fill the pop water is noted. The flow rate should be no greater than 600 L/H/square metre of filter media surface when the water level in the filter is at the very top. Water is continuously added during the measurement process. The maximum flow rate for this concrete filter is approximately 45 L/H.

If the flow rate is within 10 per cent of the 45 L/H maximum the preparation of the filtering media may be considered OK. If it is higher the filtering media should be washed less. If it is too low (low is actually better) it must be washed more. Experience with the media will determine the exact washing procedure. It is better to initially **under wash** and determine the installed flow rate. The same media can be removed washed again and re-installed. A great deal of work can be saved using this method.

The calibration procedure is normally performed one time for each new source of media. Note that crushed rock from two different sources may have very different characteristics.

Filter Disinfection

Once the flushing is completed the filter must be disinfected and flushed again. The disinfection will sterilize the inside of the standpipe and the bottom two layers of filtering media – the underdrain gravel and separating media. It is not necessary to sterilize the fine filtering media as it will ‘clean-up’ with use.

Preparation of Disinfection Solution

Note: the following solution will kill bacteria and viruses but not parasites. Parasites are removed by the filter.

Bleach

Use a 5.25% bleach solution without soap or phosphate additives. Clorox or Jic bleach works well but the quality of the bleach can be quite variable and is often much lower.

Experience indicates that it is more reliable to simply add bleach to three litres of filtered water until the water has a distinct chlorine odour, after stirring

Note how much chlorine was used to guide in the next filter installation.

(The strength of bleach decreases with age and sometimes with country so the ‘smell’ technique is often the only guide we have to determine if our bleach solution is strong enough.)

Three litres of disinfecting solution is adequate because it is only necessary to disinfect the standpipe and the underdrain and separating media.



24. Preparing disinfection solution.



Disinfection

25. Construct a tube similar to the one shown in the photo.

26. Pour approximately two litres of the solution prepared as described below into the top of the tube (easier if depth of water in filter is low.)

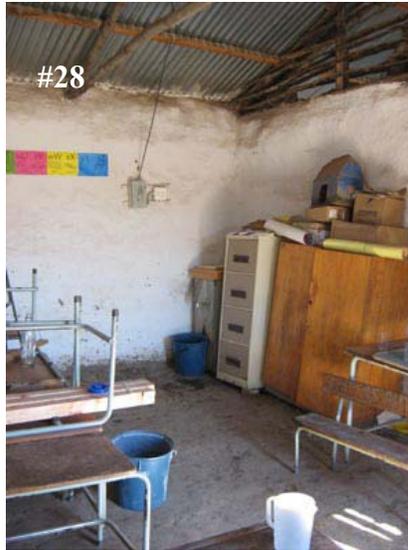


27. Pour another bucket of water into filter and allow to drain. This will flush out the chlorine solution. The filter is ready for use.



28. Note that several buckets of water will need to be poured through the filter before all of the chlorine taste disappears.

Also, the water might have a slight taste of 'rocks' for a day or so but this will also disappear.



The filter will have a useful life of more than ten years if it used and cleaned as recommended.

Implementation Considerations

- It is *very important* to provide adequate training to people who intend to use the filter.
- They must be trained how to use the filter; protect it from animals and children and how to clean it.
- It is *very important* that people who have just obtained their filter be visited after a week and after a month to insure they are operating the filter properly and to resolve any problems they are having.
- People need to know who to contact if they have problems.

Cleaning the Filter

With use the filter the production of filtered water will decrease. This occurs slowly or very quickly depending on how 'dirty' (concentration of particles) the source water is.

Cleaning is performed in exactly the same way as described in Steps 16 to 18.

Cleaning may be performed as often as required.

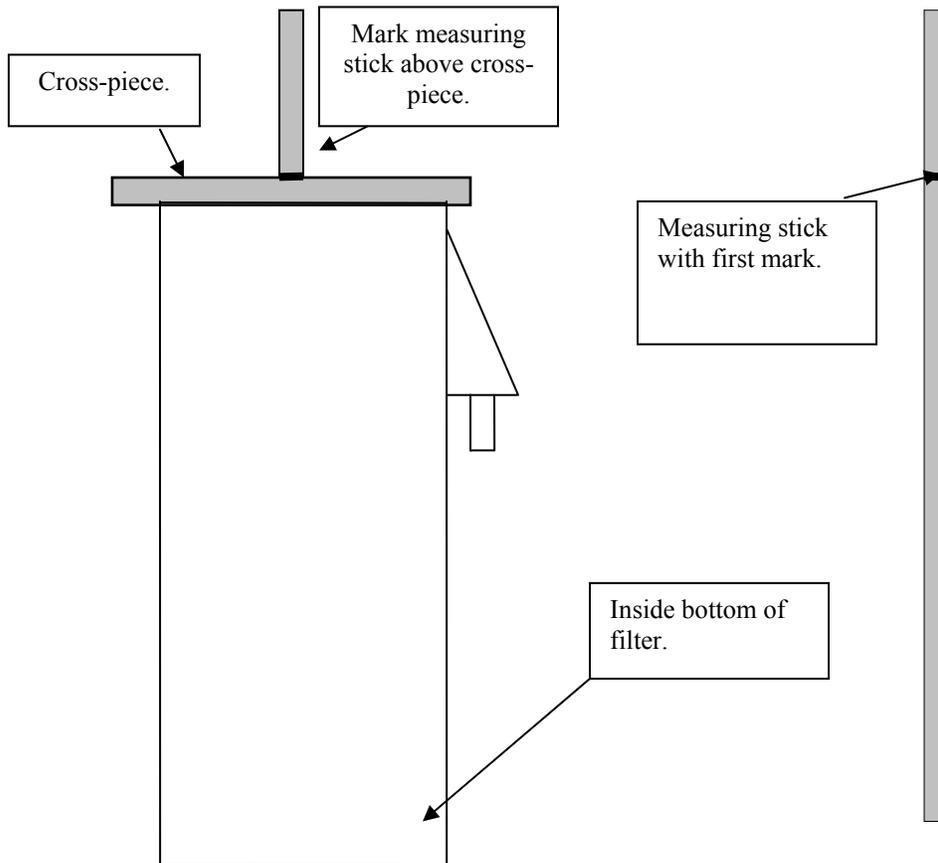
Disinfection of Filtered Water

It is recommended that even the filtered water be disinfected using a small quantity of chlorine bleach to insure that the water contains no living bacteria or viruses. Chlorine bleach should be added just to the point that the water has a chlorine odour. If the taste of chlorine is objectionable the water may be left to stand and the chlorine odour and taste will disappear. The filter will remove all of the parasites that the chlorine can not kill. Filtered water requires much less chlorine to disinfect than unfiltered water.

Construction of 'Measuring Stick'

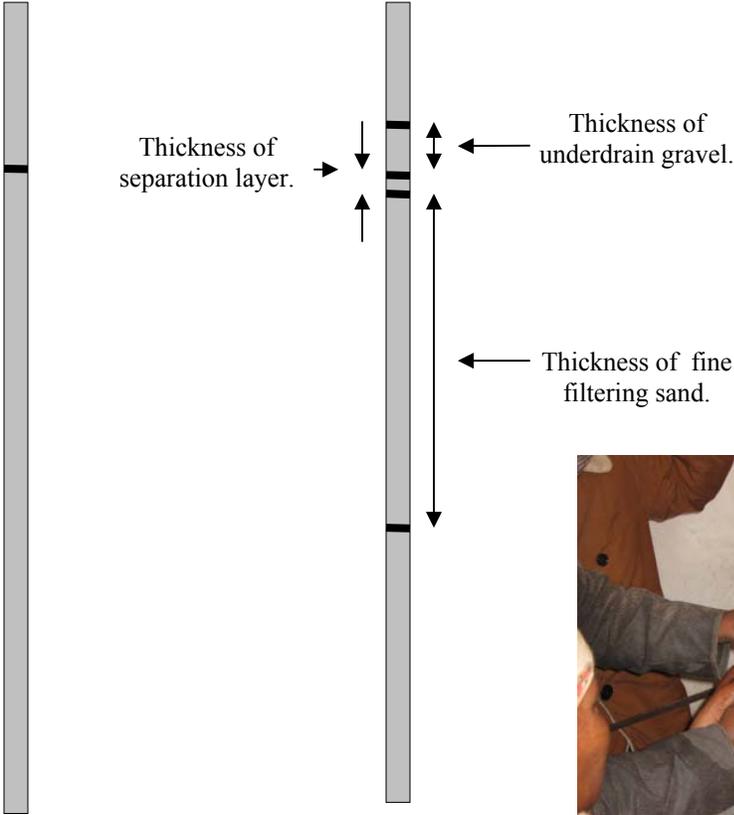
Step One

Place measuring stick inside filter with bottom of measuring stick touching the bottom of the filter.
A mark is made on the measuring stick above the top of the cross-piece of wood – so the mark is easy to see when the system is used.



Step Two

Mark measuring stick as shown below.



Use of Measuring Stick
To Install Filter Media

