Trailblazer Foundation

Helping the World
One Step at a Time

Trailblazer

Volunteer's Manual

An illustrated guide to building BioSand filters in record time

Bio-Sand Mold Preparation

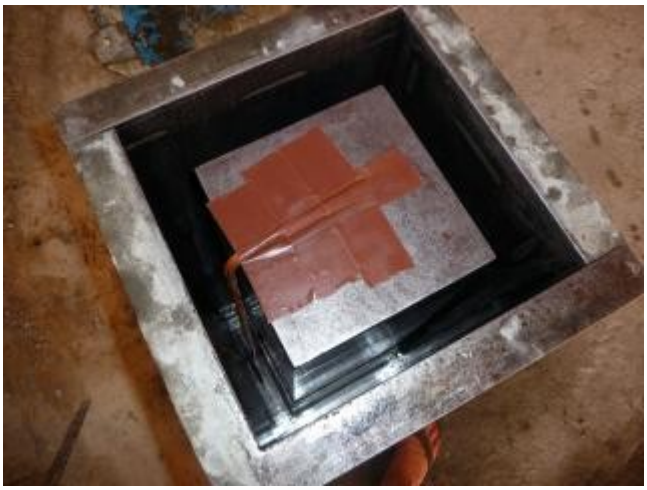
Dismantling Molds to Remove New Bio-Sand Filter

1. Unbolt bottom bolts. DO NOT unbolt sides, only loosen. Put bolts in lubricant
2. Lay the mold down on tire
3. Remove centre-piece of mold using base screw
4. Stand the filter upright
5. Unbolt sides. Place bolts in lubricant.
6. Remove nozzle plate and nozzle cap
7. Careful not to damage the nozzle as you remove sides using rubber hammer
8. Lay down mold parts on tires in position for reassembly
9. Scrape away excess concrete with paint scraper from all mold surfaces
10. Wipe away all concrete dust from all mold surfaces

Assembling and Preparing Molds for Concrete

1. Coat with oil, covering all sections carefully to avoid concrete sticking to mold sides. DO NOT oil the top of the centre-piece
2. Lift sides into place on the centre-piece, loosely align them with groves
3. Put all bolts in and hand-tightened. Side bolt's first, then bottom bolt's
4. Tighten all bolts firmly when all bolts are in place
5. Insert and align copper pipe and tape it down (Trailblazer staff supervision)
6. Shovel concrete. Careful of copper pipe (Trailblazer staff supervision)
7. Pack concrete using rubber hammer and steel rod (Trailblazer staff supervision)
8. Remove section of tape over copper pipe
9. Smooth off filter base using a trowel (Trailblazer staff supervision).
10. Clean up rubbish, wash tools and put them back in their storage location

Tips	Use short bolts in base section Most bolts can be hand-tightened most of the way If force is needed, press the bolt whilst rocking mold If further force is needed, use a rubber mallet on the mold Clean lubricated bolts are faster so keep lubricant and workspace clean



Concrete Preparation for Molds

Materials required for one batch of 4 filters

- Gravel 7 buckets
- Sand 5 buckets
- Concrete 50kg bag
- Latex 300 ml

Preparing gravel for concrete

(BLUE Mesh; 18L large buckets); 7 buckets = 4 filters

1 Sift small gravel through blue mesh
   1.1 Only 1-2 shovels at a time of gravel at a time to reduce wear on mesh
   1.2 Sift over plastic mat and tubs or wheelbarrow to collect gravel easily
   1.3 Throw away everything too big to go through the mesh
2 Wash the sifted gravel
   2.1 Lay out two washing tubs and fill with water
   2.2 Put washing net over a big tub filled with water
   2.3 Fill with 5 shovels of gravel (5 shovels approx 1 Large Bucket)
   2.4 Wash gravel using washing net as shown (approx 40 lifts)
   2.5 Lift net and let water run off
   2.6 Wash in the second tub with clean water (approx 40 lifts)
   2.7 Pour gravel in bucket
   2.8 Empty the first tub, clean and refill with water
   2.9 For the next wash, start with the second tub to save water
3 Bring buckets to blue stockpiling area next to concrete mixer
4 Clean up: wash and put away tubs, put tools back to their storage location.

Easiest with		3 people
Stockpile	Time Amount	3 hours 35 buckets
Tips	One person shovels and fills buckets Two people use washing net Rhythm helps as does stepping back to use body weight more than arms	

Preparing sand for concrete (GOLD) – 5 buckets for 4 filters

1. Sift sand using gold mesh
    1. Set up workstation as shown in picture
    2. 1-2 shovels of sand at a time to reduce wear on mesh
    3. Gently move sieve back and forth
    4. Throw away everything too big to go through the mesh
    5. Fill buckets up to 1 inch from top
    6. Bring them to gold storage area next to concrete mixer
2. Clean up materials' heap and put tools back to their storage location
3. Sand for concrete does not need to be washed.

Easiest with		2 people
Stockpile	Time Amount	2 hours 25 buckets
Tips	Dry sand is much faster/easier Lay down a mat under the buckets to collect all sifted sand	

Bio-Sand Filtration Media Production

Materials required for 1 filters

- 3.00L of Big Gravel
- 3.25L of Small Gravel
- 25L Sand

Sifting Small Gravel for Stockpile

1. Sift small gravel through BLACK mesh.
    1. Only 1-2 shovels at a time of gravel at a time to reduce wear on mesh
    2. Sift over plastic mat and wheelbarrow/tubs to collect gravel easily
    3. Throw away everything too big to go through the mesh
    4. Sifted gravel goes in Small Gravel Stockpile

Easiest with		2 people
Stockpile	Time Amount	2 hours 5 wheelbarrows
Tips	Gravel will be washed later, looking only for size Make sure you remove everything but small gravel Rotate between shaking and shoveling	

Washing Small Gravel

1. Fill 1 Large bucket with gravel & two washing tubs with water
2. Wash Small Gravel 4 times in clean water using mesh
3. Place 3 handfuls of washed Small Gravel in small Sieve
4. Fill with clean water and shake until empty of water
5. Rotate 90˚ and repeat until no tiny gravel is falling through
6. Put in clean bucket and repeat up to top of holes in bucket
7. Measure out each container, draining off all water, stack neatly in finished Small Gravel area

Easiest with		2 people (for conversation)
Stockpile	Time Amount	3 hours 24 containers
Tips	Washing well to start with reduces sifting time Keep water flowing through small sieve at all times Hold Sieve with hands under holes to tell when clean (no more sand falls through) This is very time consuming, the more people the better	

Sifting Large Gravel for Washing

1 Sift Large Gravel through Green mesh.

1.1 Only 1-2 shovels of gravel at a time to reduce wear on mesh

1.2 Sift over plastic mat and wheelbarrow to collect gravel easily

1.3 Keep everything big enough no to go through the mesh (what goes through is not needed)

1.4 Full containers go in Large Gravel Stockpile

Easiest with		2 people (for conversation)
Stockpile	Time Amount	2 hours 8 wheelbarrows
Tips	Gravel will be washed later, looking only for size Make sure you remove everything but Large Gravel Rotate between shaking and shoveling	

Washing Large Gravel

1. Lay out two washing tubs and fill with water
2. Put washing net over a big tub filled with water
3. Fill with 3 shovels of gravel
4. Wash gravel transferring between buckets until water stays clean
5. Measure out each container using white bucket with holes, draining off all water, stack neatly in finished Large Gravel area

Easiest with		3 people
Stockpile	Time Amount	2 hours 24 containers
Tips	2 people wash whilst the other fills the tubs with water	

Sifting Sand for Washing

1. Place a maximum of 2 shovels on fine sieve (Gray/Silver)
2. Use gloves, push sand through sieve
3. 1 weeks sand is approx 110 shovels

Easiest with		2 people
Stockpile	Time Amount	2.5 hours (about 1 week's worth of sand or 12 big rice bags) 1 week only to prevent contamination (cat sh*t)
Tips	Dry sand is much faster Push sand into lines then push through lines	

Washing Sand

1. 3 shovels of sifted sand per 18 L bucket
2. Use hose to stir all sand up into water
3. Skim off scum layer on 1st fill
4. Stir to suspend sand in water
5. Drain slowly removing all suspended particulate, letting sand settle
6. Repeat 2-3 times (test after 2 times if it is you first day cleaning sand)
7. Test water clarity, correct quality is very important! Put about 1/3 sand in tester, fill with clean water. Shake and let settle. You should be able to see the sand line after 3-4 seconds.
8. Transfer to blue (15L) buckets
9. Three blue buckets per fish bag
10. Stack fish bags neatly

Easiest with		2 or 3 people, 2 people to lift fish bags
Stockpile	Time Amount	2 hours (about 1 week's worth of sand or 12 fish bags) 12 bags/session, 24 bags total
Tips	Spinning sand with hose is the easiest way to suspend all sand Drain off sand slowly as soon as all sand is suspended in water	

Weekly Cleaning and Maintenance Jobs

- Tidy all material heaps
- Replace all Rubbish Bags
- Change Lubricant in Bolt Containers
- Dig out trench behind Washing Station to Agriculture Area
- Clean all Concrete Areas
- Clean Painting Areas
- Check and Repair all Sieves and Washing Net
- Note any other needed repairs
- Note all required materials for following week
    - Gravel: Big and Small
    - Sand
    - Concrete
    - Oil
    - Latex
    - Paint
    - Mesh for Sieves
    - Washing Nets
    - Replacement Containers for Materials

Filter sand Washing

Testing procedure

To test sand washing:

- Fill tester with half sand, and half CLEAN water (from tap, not from bucket)
- Shake to mix water and sand
- Leave to rest 3-4 seconds and compare results to pictures below

		
Not clean enough	About right	Too clean
Wash again	Transfer sand to blue bucket	Don't do it again!

Washing the sand too much is not helpful because it renders the BioSand filter ineffective. The biological layer that is supposed to develop in the filter once installed does not do so if the sand is too clean.