

## Grain Size Analysis Mini Sieve Set Fabrication Instructions

### Purpose:

These instructions are intended to help anyone to fabricate the sand sieve analysis sets for humanitarian purposes. These sets include a stack of different sizes of wire mesh screens, with a catchpan on the bottom, to sieve a sample of fine sand. After sieving, the amount of sand retained on each size of screen is measured using a graduated cylinder. The results are plotted on graph paper to analyse the sand grain size and size distribution. This is an important tool because the fine sand used in biosand filters to treat drinking water must be prepared within certain size specifications for it to work properly. The sand sieve analysis set is a quality control tool to provide these measurements.



Notes for volunteers making sieve sets at the CAWST office:

1. The materials described below are normally stored at the CAWST office, next the water quality testing storage area on the upper two large shelves.
2. To order more materials, see Table: Sieve Analysis Sets – Suppliers and Pricing, at the end of this document.
3. The tools described below are kept in a clear plastic box container on the top large shelf beside the water quality testing storage area. The boards and weights (to apply pressure while the glue sets) need to be sourced from CAWST’s back shop.

### Materials:

Item	Comments
<u>Wire screen (opening size):</u> #24 mesh (0.71 mm) #40 mesh (0.38 mm) #60 mesh (0.25 mm) #80 mesh (0.18 mm) #150 mesh (0.10 mm)	<ul style="list-style-type: none"> <li>• Require one 10.2 cm (4”) diameter circle, of each screen size, for each sieve set (total five 4” screens per sieve set). Nine 4” diameter sieve screens can be cut from each 30.5 cm x 30.5 cm (12” x 12” or 1 sq. foot) of wire screen.</li> </ul>
Catchpan bottoms	<ul style="list-style-type: none"> <li>• These are flat plastic circles that are glued to the sieve bodies (same as a screen) to make the Catchpan.</li> <li>• Require one Catchpan bottom per sieve set</li> </ul>

Sieve body	<ul style="list-style-type: none"> <li>The 10.2 cm (4”) sieve body is the molded plastic ‘bowl’ which hold each 4” screen and Catchpan bottom.</li> <li>Require six sieve bodies per sieve set</li> </ul>
Sieve rings	<ul style="list-style-type: none"> <li>Also called ‘Wagon Wheels’, these are plastic rings with ‘spokes’ that are used to hold the screen to the sieve body and support the screen underneath.</li> <li>Require twelve rings per sieve set. Note: One ring is glued onto each sieve body (with the screen inbetween), and a second ring is used temporarily to help apply pressure after the glue is applied. Only six of the rings are glued, the other six are recovered after the glue sets.</li> </ul>
Labels; CAWST	<ul style="list-style-type: none"> <li>A label is placed on the outside of each sieve body to identify CAWST and provide our address and website.</li> <li>These are printed out on <i>Avery</i> forms beforehand then peeled off the sheet when needed.</li> </ul>
Labels; Sieve screen size	<ul style="list-style-type: none"> <li>Each sieve is labelled with its screen size: #24 mesh; #40 mesh; #60 mesh; #80 mesh; #150 mesh; Catchpan</li> <li>The <i>DYMO</i> label-making machine is used for these.</li> <li>They can be produced in bulk beforehand.</li> </ul>
Lid, (plastic)	<ul style="list-style-type: none"> <li>One 4” lid that fits snugly onto the top (#24 mesh) sieve body is used to hold the sand inside while the set is shaken.</li> </ul>
Graduated Cylinder, Laminated Instructions & Worksheet (8 pages), erasable pen, 3 large elastic bands, and one large ‘Ziploc’ type bag.	<ul style="list-style-type: none"> <li>One of each are needed to make the Sieve Analysis Set complete (a container is optional)</li> <li>The laminated instructions/worksheet are found in the file “PI for BSF_Sand Grain Size Analysis_2012-05” and can be laminated at CAWST office (with laminating machine) or at Office Depot</li> <li>The erasable pen, large elastic bands and bags can be sourced at Office Depot or Wal-Mart.</li> </ul>

Tools	Comments
Metal Cutter and Scissors	<ul style="list-style-type: none"> <li>The heavier screen (#24) requires ‘tin snips’ to cut the circular shapes, but sturdy scissors work fine to cut the finer screens.</li> </ul>
Gloves	<ul style="list-style-type: none"> <li>The cut screen can cause small cuts to the hands – use gloves if this is a problem.</li> </ul>
Permanent marker pen	<ul style="list-style-type: none"> <li>A fine point permanent marker is used to draw circles on each screen. The mesh number is also written on each round circle screen in permanent marker to identify its size in case the label is removed.</li> </ul>
Glue	<ul style="list-style-type: none"> <li>This glue holds the screen to the sieve body with the help of the rings.</li> <li><b>The glue used and how it is applied is critical to the life of the sieve set. We had had problems with sieve screens coming out of the sieve bodies.</b></li> <li><b>We currently use Gorilla Glue – sold at the local Home Depot hardware.</b></li> </ul>

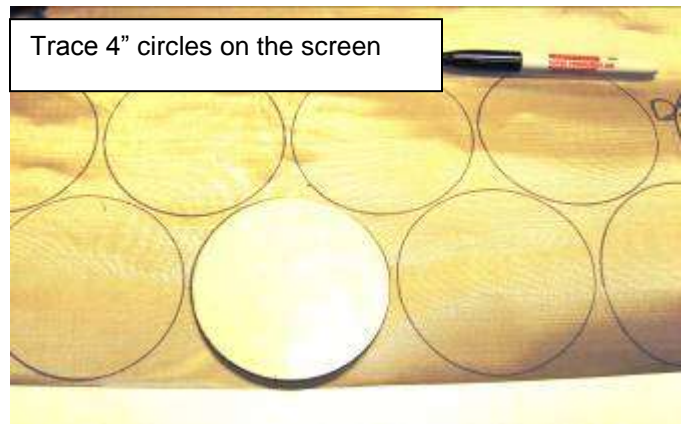
Boards and Weights	<ul style="list-style-type: none"> <li>• These are used to provide continuous pressure on the sieve bodies and rings to secure the screen between as the glue sets.</li> <li>• Figure out how many sieve sets you plan to make and have enough boards and weights ready to use to hold pressure on each individual sieve while the glue sets.</li> <li>• Suggest boards 2.5 cm x 15 cm (1" x 6") by 1.5 m (5') long. One 5 foot board will suffice for each 12 sieve bodies. These can be stacked but an extra board is needed on top of each stack.</li> <li>• Weights should be clay bricks or concrete blocks (or whatever else is available to balance on the boards).</li> </ul>
DYMO Label Making (using clear plastic tape)	<ul style="list-style-type: none"> <li>• The mesh sizes are stored in memory and can be printed from the memory – see instruction manual</li> <li>• The clear plastic tape works better than the paper tape.</li> </ul>

**Instructions:**

A. Cut out the screen:

1. Gather materials and tools:

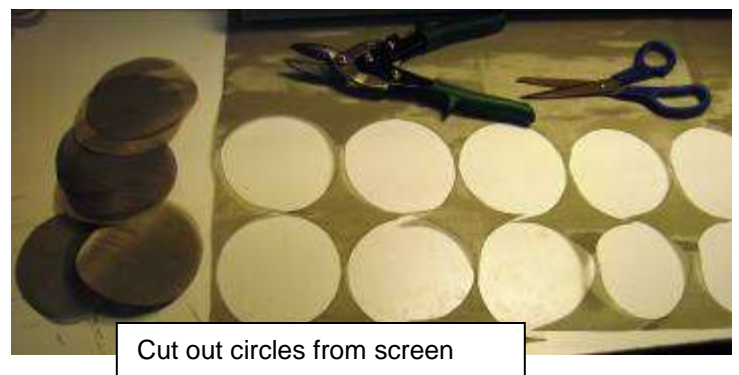
- the 5 screen sizes to cut-out,
- scissors or metal sheet cutters,
- and
- the permanent marker pen
- use one of the Catchpan bottoms as a template for mark the circles on each screen.



2. Layout the screen on a table or the floor and spread flat. Using the pen trace a 10.2 cm (4") diameter circle on the screen using a plastic Catchpan circle as the template. Also, within each circle write the mesh number (e.g. #24) to identify the screen size.

Tips:

- check that the diameter of the plastic circle plate fits properly into the bottom of a sieve body before using as a template to cut the screen,
- to avoid wasting screen, draw the circles close together, so that the lines of each circle just touch each other.

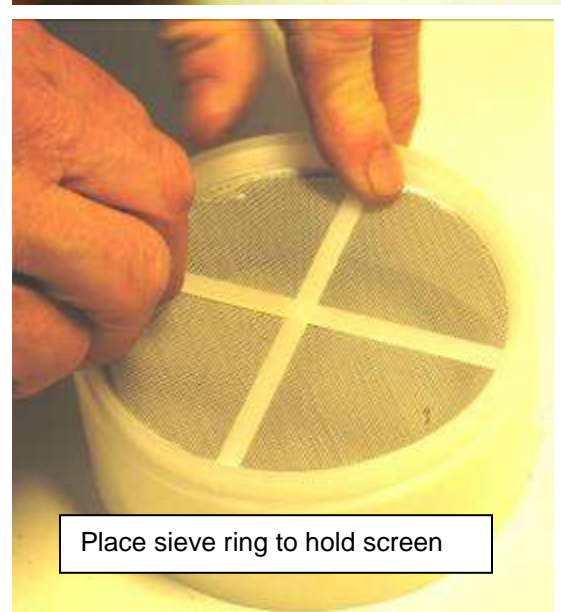
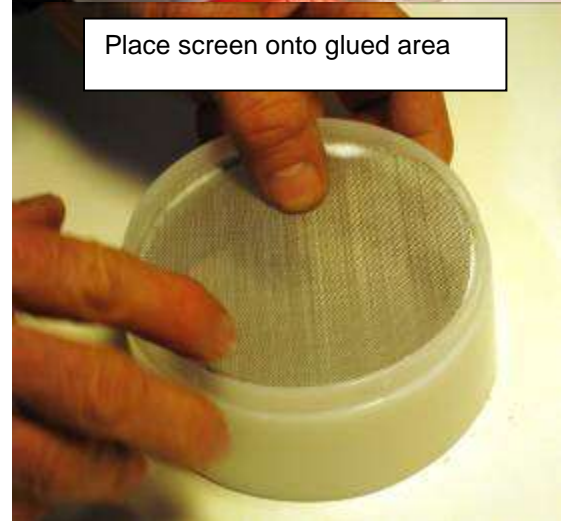


3. Cut the circles out using the scissors or sheet metal cutters and store in stacks – one stack for each size.

- Cut enough screen to provide one sieve screen of each size for all the sieve sets planned for fabrication.
- Trim any screens that will not fit flat into the bottom of a sieve body leaving no gaps between the sieve screen and the plastic sieve body when viewed from above.

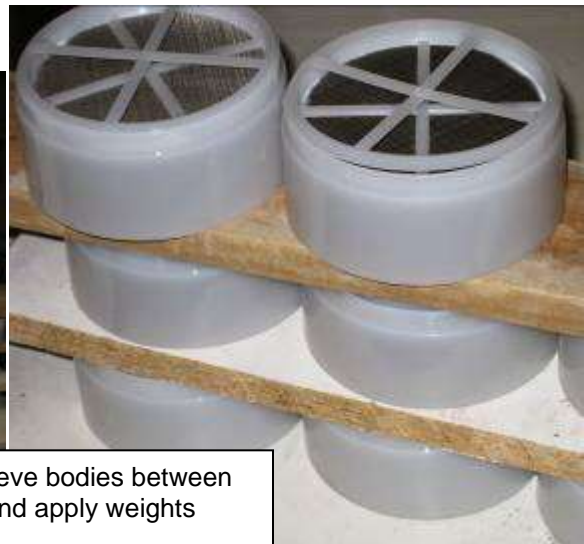
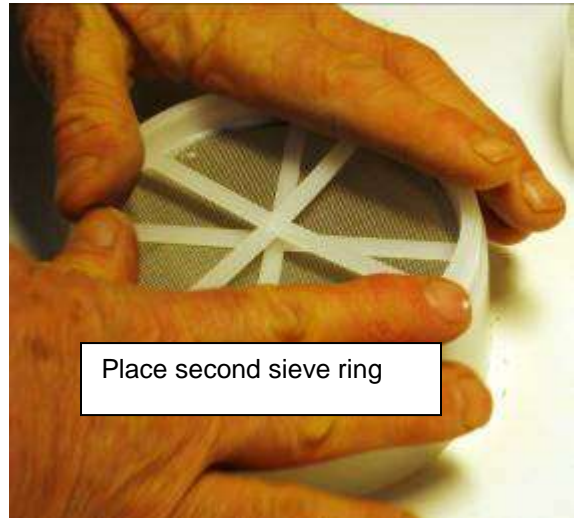
**B. Glue the sieve screens onto the sieve bodies.**

1. Gather the materials: sieve bodies, sieve rings, catchpan bottoms and the 4" sieve screens cut above.
2. Gather the tools: have the glue ready and all the boards and weights necessary to apply pressure on the glued surfaces (as soon after the glue is applied as possible).
3. Turn the sieve body upside down so that the flat surface of plastic is facing up.
4. Run a small continuous bead of glue around the entire edge of the flat surface of plastic – try not to put too much glue on as it will squeeze out onto the screen – but it should be continuous so that the entire edge of the sieve screen is glued.
5. Place the 4" circle sieve screen onto the lip of plastic body (with the glue on it) and hold flat.
6. Place the sieve ring ('wagon wheel') above the screen so that the screen is sandwiched between the plastic body and the sieve ring. Press the ring down as far as it will go to hold the screen.
7. Place a second sieve ring directly above the first one so that its bottom edge extends beyond the bottom of the sieve body. This (temporary) ring is necessary to transfer the pressure to the glued area.





8. Do the same steps for the Catchpan bottom - glue the plastic sieve bottom onto the sieve body – one for each set, same as above for the sieve screen.
9. Place the glued sieve body on a board then place another board above it to sandwich a row of freshly glued sieves (5 foot boards will allow about 12 sieve bodies at once). Place weights on the top board to press the pieces together while the glue sets. It best to let the glue set overnight but a couple of hours may be sufficient.



C. Label the sieve bodies.

1. Gather the materials; CAWST labels, and the mesh size labels (read the *DYMO* instructions on how to make these labels).
2. Remove the sieve bodies from between the boards (once the glue has had time to set). Remove the second ring (wagon wheel) and return it to storage.
3. Place the CAWST logo with address and website on each sieve body.
4. Place the correct mesh size/ catchpan label on each sieve body.



- Check to be sure that the label number matches the screen size (mesh #) written in pen on the screen before it was cut out.

D. Complete the sieve analysis sets.

1. Gather the materials; labelled sieve bodies, 4" lids, laminated instructions, cylinder and elastic bands.
2. Stack the completed sieves in the correct order; starting with the Catchpan on the bottom, followed by #150, #80, #60, # 40, #24, and then place the lid on top.
3. Wrap the stacked set with the two laminated pages of instructions and worksheet and hold together with a large elastic band.
4. Place in large 'Ziploc' type bag (or equivalent) along with the graduated plastic cylinder, and erasable pen.
5. Place two large elastic bands around the bag and place the completed sieve analysis sieve sets in storage beside the water quality testing bench.

Please notify Tommy Ngai at [tngai@cawst.org](mailto:tngai@cawst.org) for any comments on these instructions.

***Thank you for your help!***

Cost of materials for making mini sieve sets (Canadian Dollars, as of August 2012):

	Supplier	Price (Tax Included)	Number of Units Required per set	Total Cost For Material
<b><u>Plastic Components:</u></b>				
Sieve catchpan	Petrocraft	\$1.52	1	\$1.52
Sieve 4" body	Petrocraft	\$2.21	6	\$13.26
Sieve 4.5 ring	Petrocraft	\$2.21	6	\$13.26
<b><u>Wire Screen:</u></b>				
24 mesh	Ferrier Wire	\$0.47	1	\$0.47
40 mesh	Ferrier Wire	\$0.47	1	\$0.47
60 mesh	Ferrier Wire	\$0.50	1	\$0.50
80 mesh	Ferrier Wire	\$0.50	1	\$0.50
150 mesh	Ferrier Wire	\$0.64	1	\$0.64
<b><u>Miscellaneous items:</u></b>				
Graduated Cylinder	Forestry Suppliers Inc.	\$9.00	1	\$9.00
Erasable Pen	CAWST	\$1.00	1	\$1.00
Printed Manual	CAWST	\$1.50	1	\$1.50
Lid	CAWST	\$0.50	1	\$0.50
Glue	Gorilla Glue, Home Depot	\$1.00	N/A	\$1.00
<b>Total Cost:</b>				<b>\$43.12</b>

Supplier contact information:

**Petrocraft Products**, 2410C 2nd Ave. SE, Calgary, AB, T2E 6J9

**Ferrier Wire Goods Company Limited**, 170 Mulock Avenue, Toronto, ON, M6N 3C8; PHONE 416-769-5280; email: [info@ferrierwire.com](mailto:info@ferrierwire.com)

**Forestry Suppliers** - phone (sales) 1-800-647-5368, email: [sales@forestry-suppliers.com](mailto:sales@forestry-suppliers.com)

