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WaterBath

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Mock-Coastal-Environment

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ABSTRACT

Instructions for creating a mock coastal environment using laboratory equipment and consumer products. This protocol covers the modification of the water bath with lights, heating and cooling. Electronic setup of controlling these heating and cooling systems are covered elsewhere on the project page.

PROTOCOL CITATION

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MATERIALS TEXT

- Fisher Scientific™ Isotemp™ 27 L shaking water bath
- Circulating chiller (LAUDA-Brinkmann WK 230 circulating chiller)
- tubing to attach chiller to barbed adapter for copper pipes
- 2x 310x310mm 3d printer heater pad. (https://www.amazon.com/Silicone-310x310mmx1-5mm-Creality-Printers-Adhesive/dp/B07FB1TZ25/)
- 1/2" Copper pipe (https://www.homedepot.com/p/Mueller-Streamline-1-2-in-x-10-ft-Copper-Type-L-Pipe-LH04010/100354232)
- 1/2 to 1/2 elbows (https://www.homedepot.com/p/Everbilt-1-2-in-x-1-2-in-Copper-90-Degree-Cup-x-Cup-Elbow-10-Pack-CP607HD12/204620480)
- 2x Copper Pressure Cup x MIP Male Adapter Fitting (https://www.homedepot.com/p/Everbilt-1-2-in-Copper-Pressure-Cup-x-MIP-Male-Adapter-Fitting-C604HD12/204620255)
- 2x 1/2 in. Barb x 1/2 in. FIP Brass Adapter Fitting (https://www.homedepot.com/p/Everbilt-1-2-in-Barb-x-1-2-in-FIP-Brass-Adapter-Fitting-800099/300096250)
- Galvanized Steel framing stud (https://www.homedepot.com/p/ProTRAK-25-1-1-4-in-x-3-5-8-in-x-10-ft-Galvanized-Steel-Track-362PDT125-15-H/311801834)
- 2x Finnex Planted+ 24/7 HLC Aquarium LED Light (https://www.amazon.com/Finnex-Planted-Aquarium-Automated-Spectrum/dp/B07S9H64L1/)

Heating pads

1 Turn water bath on its back to gain access to bottom panel. Remove bottom panel and insulation from underneath water bath to gain access to heating pad.

2 Unscrew and thermometer from metal basin and peel off existing heating pad.

3 Attach 3d printer heating pads to metal basin and guide wires through holes in sidewall to electronic housing compartment.

4 Leave old heating pad and thermometer loose and replace insulation and metal panel.

Copper cooling pipe

5

Measure height and inner dimensions of water bath basin as well as length of outer lip.

6 Cut copper pipes to length:
- 2x length of outer lip (A)
- 2x height of water bath (B)
- 1x 4" less than width of water bath basin (C)
- 2x 1/3 length of the one pipe cut to width from above (D)
- 2x 2" less than length of water bath basin (E)
- 2x 4" less than length of water bath basin (F)

7 Solder threaded connections to ends of pipes A. Solder 90 degree joints to other ends.

8 Solder pipes B to 90 degree joints attached to A pipes. Solder 90 degree joints to other end of B pipes facing in opposite direction from previous set of joints, forming 's' shapes.

9 Solder 90 degree joints on both ends of pipes C & D in the same direction, forming 'c' shapes.

10 Connect both E pipes to joints on C pipe. Connect Both F pipes to joints of one of the D pipes.

11 Use the remaining D pipe to connect the sections constructed in steps 9 & 10 to create the shape depicted in step 5.

12 Using plumbers tape, screw on barbed ends to threaded connections on pipes A. Use silicon tape around soldered joints that will be submersed in water.

Metal Collar

13 Measure the perimeter of the base of the lid of the water bath.

14 Cut galvanized steel metal framing stud leaving an extra two inches more than the measured lid perimeter

15 Make perpendicular cuts in the two outer sides of the metal framing stud for the length of each corner-to-corner section of the lid's base

16 Make a second cut at a 30-degree angle to the perpendicular cuts made in step 14 and remove the triangular section of metal cut out.

17 If the metal framing stud has diamond shaped presses or other pressed structure in the spine/back section, hammer these pressed patterns flat at sections you made your cuts. This is to flatten the metal, so it is easy to fold where you made your cuts.

18 Fold the metal to a 90-degree angle at your cuts made in steps 14 & 15, tucking the outer sides of the metal frame into one another.

19 Secure the folds by using rivets, placing the rivets in the overlapping outer edges of the metal frame that you tucked into one another in step 15.

20 Measure where the inlet and outlet pipes of the copper cooling pipe will be in relation to when the collar is on the water bath

21 Cut out a section of the collar for the inlet and outlets based on the measurements made in step 17.

22 For a light-tight seal for the section cut out in step 18, use foam tubular pipe insulation cut. Cut the foam in short lengths, and cuts around the outside of the foam so that collar can easily set into the foam while the foam is fitted to the piping.

23 To reduce condensation buildup from dripping out from the corners of the collar, silicone caulking can be applied around the folded corners.

24 To reduce any sharp edges of the collar where cuts have been made, use a grinding stone attachment on a hand drill to grind down any sharp edges of the collar. This can also be used for small scale adjustments of the cuts that have been made if they aren't fitting perfectly.

25 For a tight seal where the collar rests on the water bath, foam tape can be placed along the base of the collar so that collar is resting on the squishable foam.

26 For a secure fit between the bath, collar, and lid, an extra sheet of galvanized steel is needed for the back. This metal should be long enough to reach from the original mounting point of the lid bracket to above the collar. Drill holes in this sheet of metal where the screw holes are for the lid bracket. Drill holes on the opposite end of the sheet of metal for the bracket. Use rivets to secure the sheet of metal to the collar ensuring that it lines up correctly with the screw holes drilled to line up with the water bath and lid bracket.