

RANGER Product demonstration prop building instructions

Solidworks files are available for all product demonstration props. Contact the [MATE competition coordinator](#) for access to the RANGER SolidWorks files. [SolidWorks Student Edition](#) is free for MATE competitors. The [eDrawings Viewer](#) is a free download that allows the Solidworks files to be viewed dynamically.

Additional information on prop dimensions can be found in the SolidWorks files.

See last page for update notes.

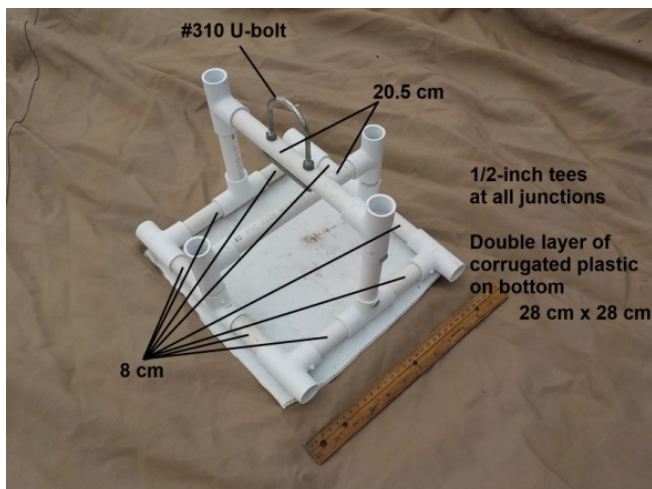
Task 1: Aircraft

Tail:



The tail shape and tail number will correspond with one of the 30 examples in the [RANGER Aircraft Identification Handbook](#).

Debris:



Vertical pipes are 11 cm in length for upper crossbar with U-bolt.

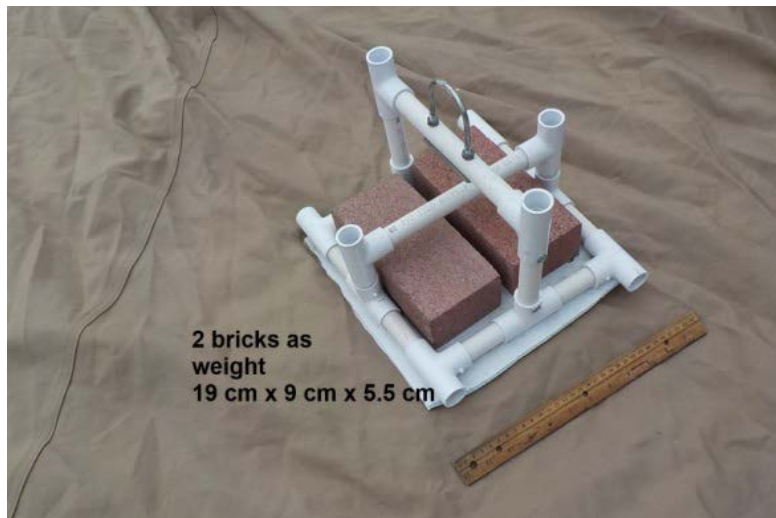
Two [bricks](#) (19 cm x 9 cm x 5.5 cm) are positioned inside the ½-inch PVC frame.

A double thick layer of corrugated plastic on the bottom of the debris holds the weight of the bricks.

Use at least eight screws to secure the double sheet of corrugated plastic onto the bottom of the PVC frame.

Tie or tape the two bricks together so they will not fall out of the debris when moved.

Debris with weight:



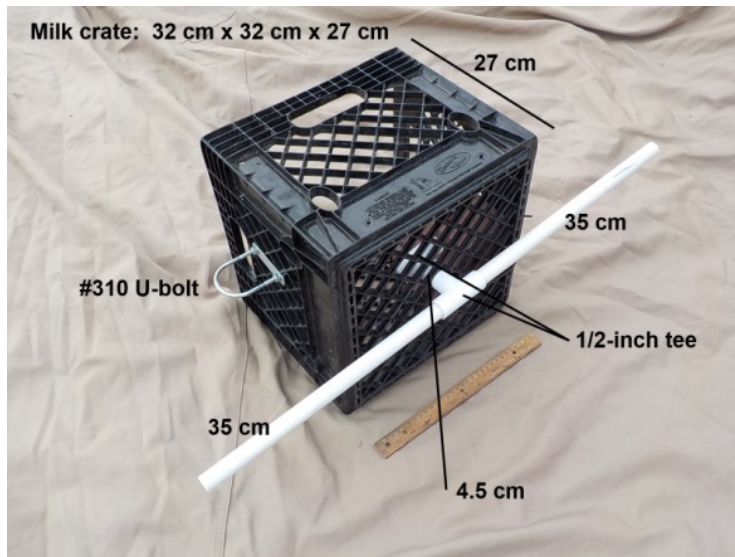
Engine, inside:



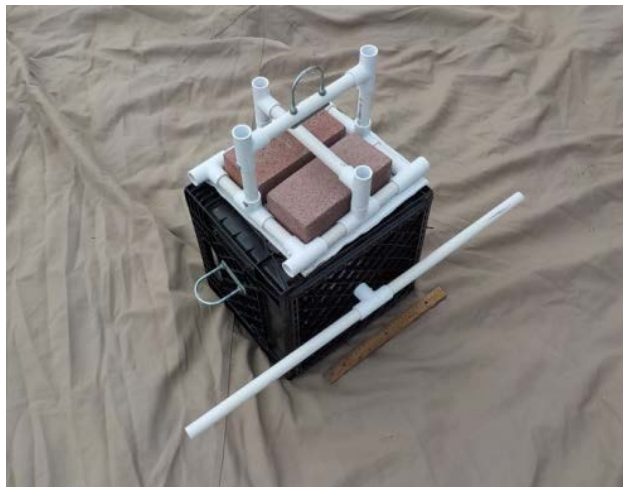
The milk crate is 32 cm x 32 cm x 27 cm.

Three [bricks](#) (19 cm x 9 cm x 5.5 cm) are positioned inside the milk crate.

The engine, propeller side:

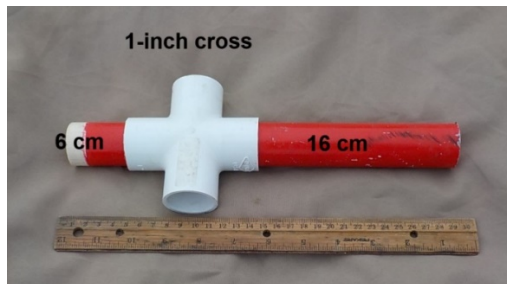


The debris on the engine:



Task 2: Earthquakes

Cable connector base:

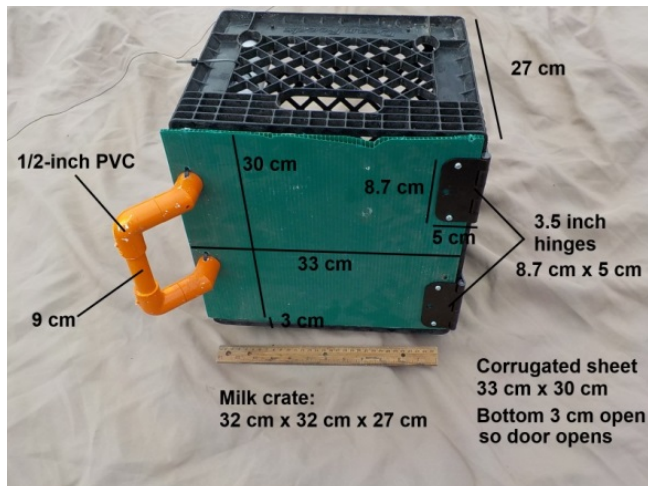


1-inch PVC is the base for building the cable connector.

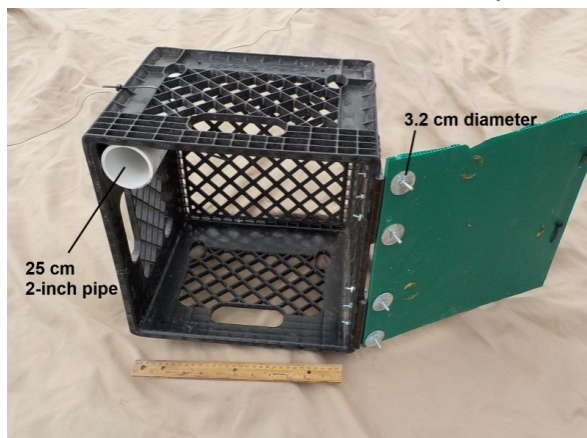
Companies may attach grab points or other means to carry the connector.

Companies must also add 2.5 meters of cable (rope, wire, etc.) from their OBS to the connector.

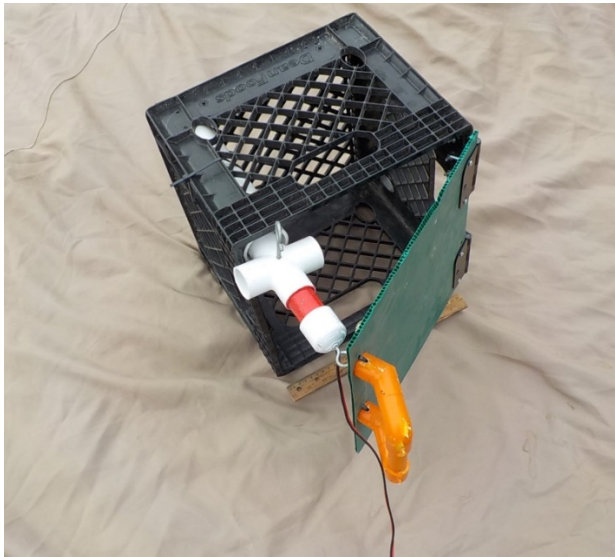
Power and communications hub, door closed:



Power and communications hub, door opened:



Power and communications hub, connector installed:

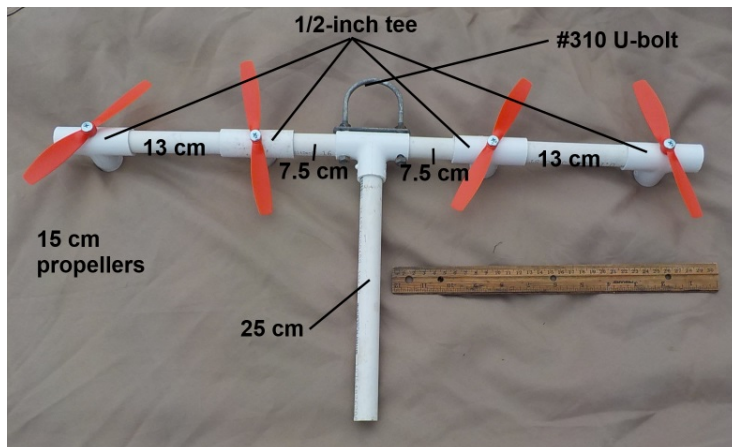


A connector installed into the power and communications hub.

At the start of the product demonstration, the company-built connector will be inserted into the power and communications hub by divers.

Task 3: Energy

Tidal turbine:



The tidal turbine has 15 cm [propellers](#) attached to tees.

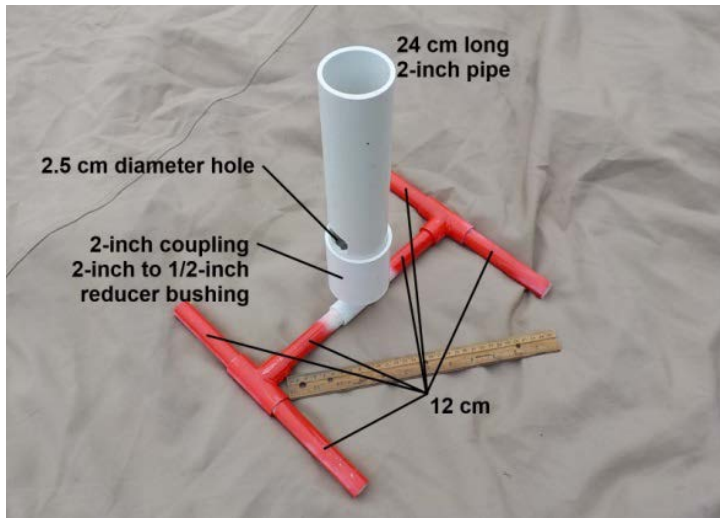
A red stripe (red plastic tape) will be added approximately 8 cm from the bottom of the tidal turbine.

This stripe must be completely within the turbine stand to successfully install the tidal turbine.

Turbine base with latching mechanism:

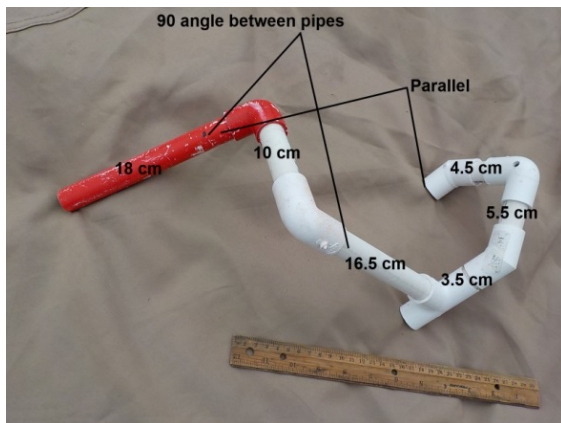


Turbine base without latching mechanism:



2.5 cm (1-inch) diameter hole drilled through both sides of the 2-inch pipe.

Turbine base latching mechanism:



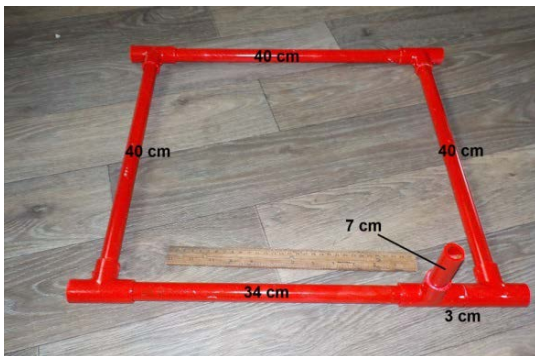
The 10 cm length of pipe fits through the 2.5 cm holes drilled into the base.

Turbine base with tidal turbine installed and latched:

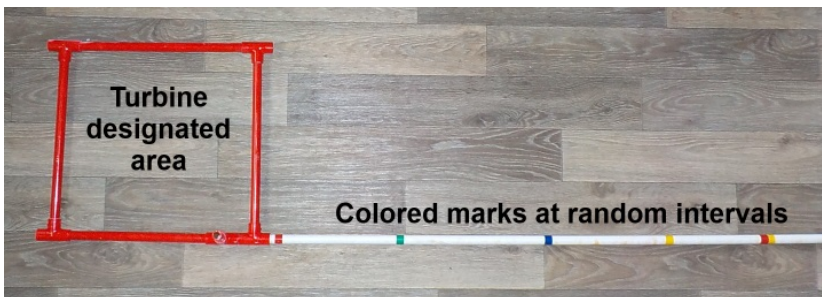


The latch handle has been rotated to bring the latch up against the tidal turbine in the base.

Turbine area:



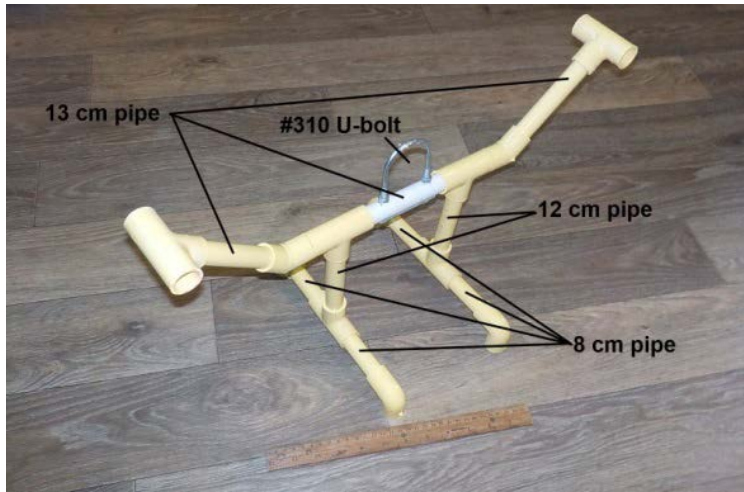
Turbine area with length measurement:



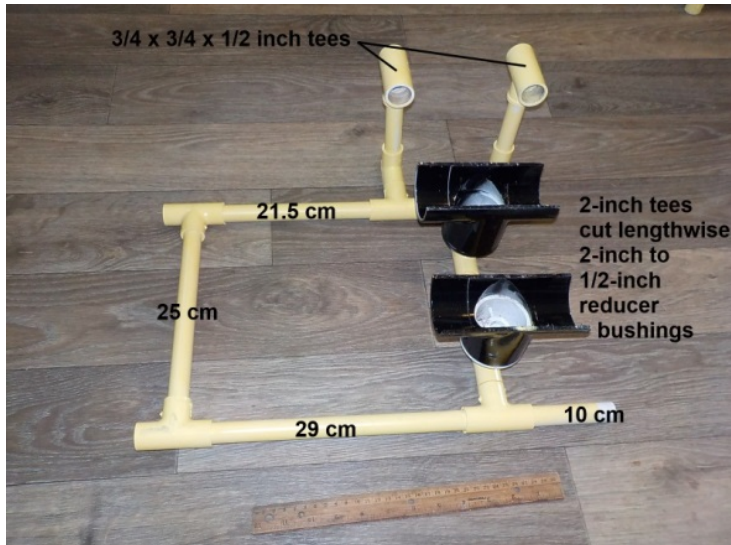
The turbine area will be painted red matching the red painted base of the tidal turbine.

The length of pipe with colored marks will be used for measuring the distance.

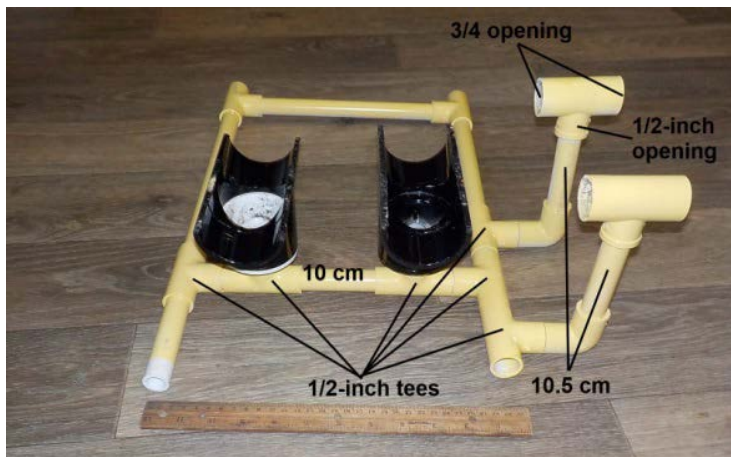
I-AMP:



I-AMP base (side view):



I-AMP base (front view):



I-AMP locking mechanism:



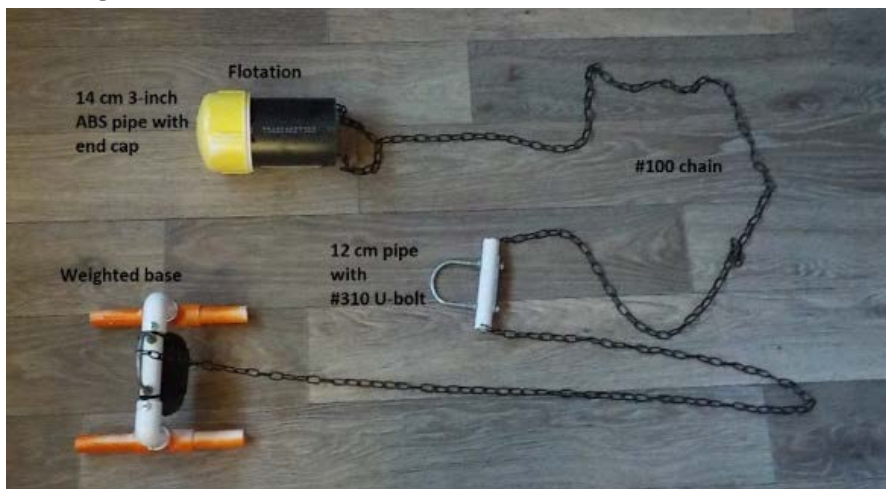
After inserting the locking mechanism through the 3/4-inch tees, attach two 90° elbows to the two ends.

I-AMP locked onto the base



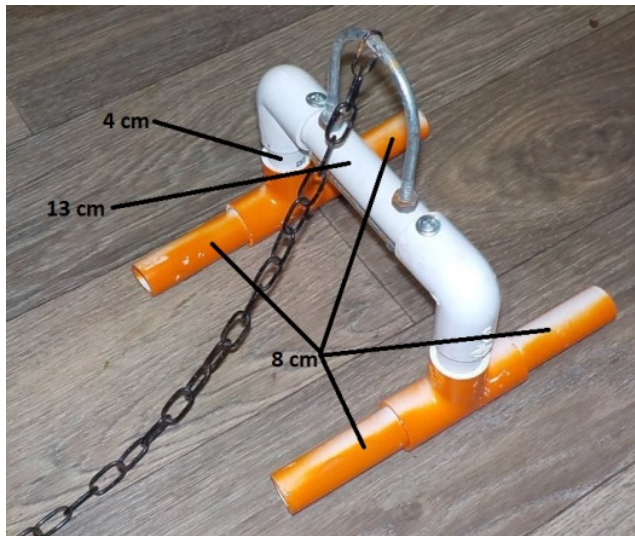
The feet of the IAMP must be within the 2-inch cradles (painted black).

Mooring:



The length of the mooring from the bottom of the base to the top of the flotation should be the depth of the pool plus 5 to 10 cm.

Mooring base:



Two 15 cm lengths of rebar inside the mooring base provide ballast.

Mooring float:



Drill two holes in the end of the 3-inch ABS pipe.
Use pliers to open the chain links and insert one into each hole.

Add foam into the mooring flotation.

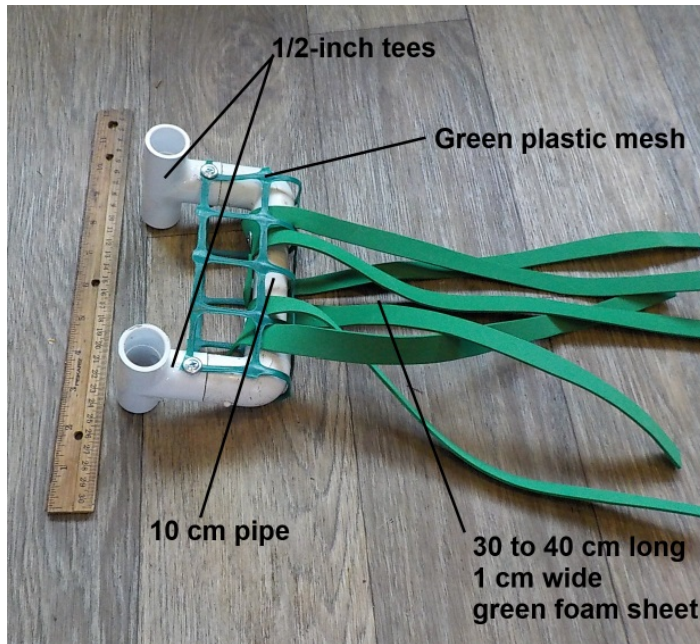
The flotation should be 3 Newtons positively buoyant in water.

Mooring attachment:



#310 U-bolt into 12 cm of pipe.

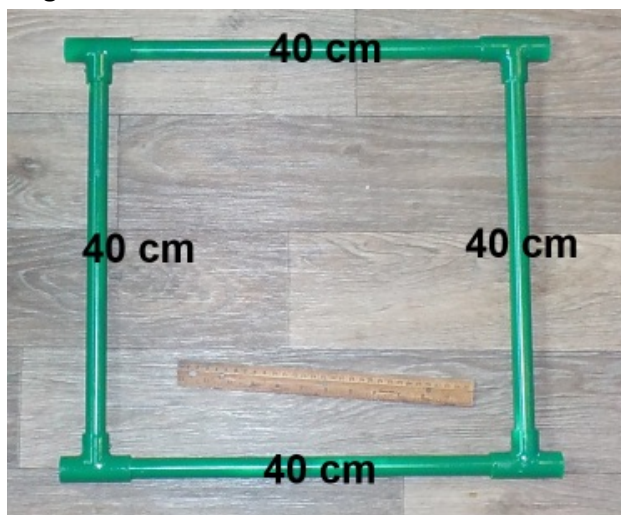
Eelgrass samples and frames:



[Foam sheeting](#) is available at Michael's craft store.

Eelgrass frames have green plastic mesh. Eelgrass samples do not have the green plastic mesh. **The mesh is created from 1-inch square mesh. A 4 square x 4 square section of mesh is used to create the eelgrass frames.**

Eelgrass area:



Additional notes

Companies should be aware that tolerances in lengths of cut pipe and length of pipe inserted into joints can change the overall dimensions of product demonstration tasks. Except where noted, companies

should expect tolerances in all product demonstration props, and should build their ROVs and tools accordingly. In no case should the dimensions for a product demonstration prop be used to calibrate a measuring device.

Home Depot part numbers are given for certain construction items. However, some Home Depot stores may not carry the listed items. If the local Home Depot does not carry the part in question, MATE recommends checking other local hardware stores or online sources, such as those listed below, for the required component.

<http://www.pvcfittingsonline.com/>

<http://pvcpipesupplies.com/pvc-fittings/schedule-40-pvc-fittings/>

Update Notes:

Updates are highlighted in yellow.

March 13, 2018

Page 14: Added new photo of mooring base with dimensions.

Page 15: Added information on plastic mesh.

Page 16: Included additional notes.