

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.

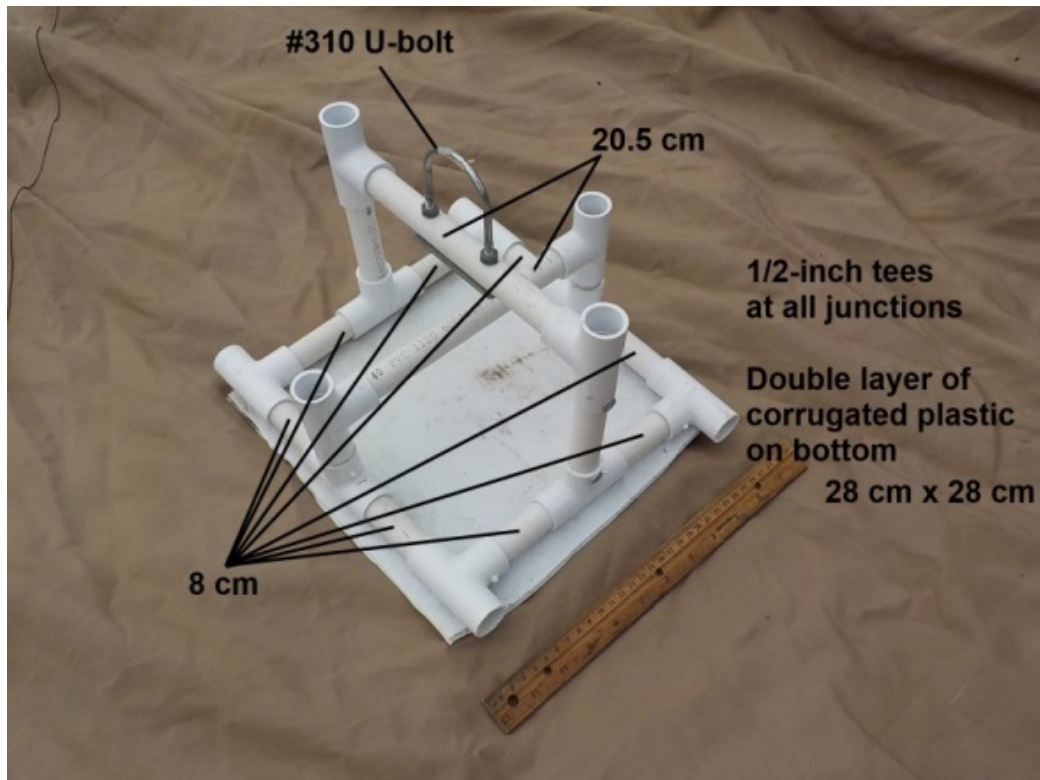
Task 1: Aircraft

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.

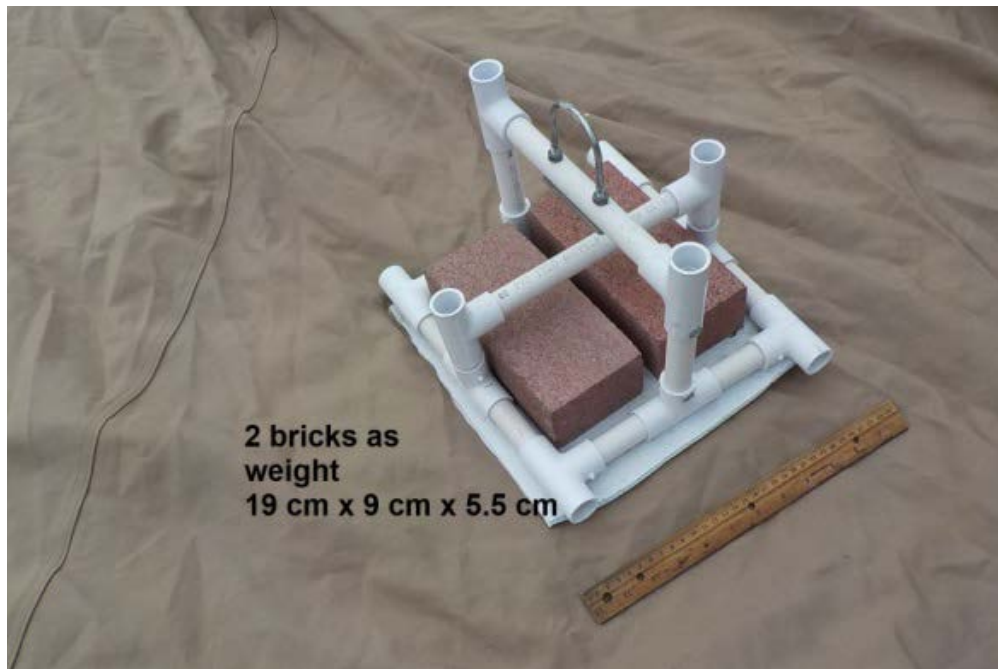
Two [bricks](#) (19 cm x 9 cm x 5.5 cm) are positioned inside the ½-inch PVC frame.

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:



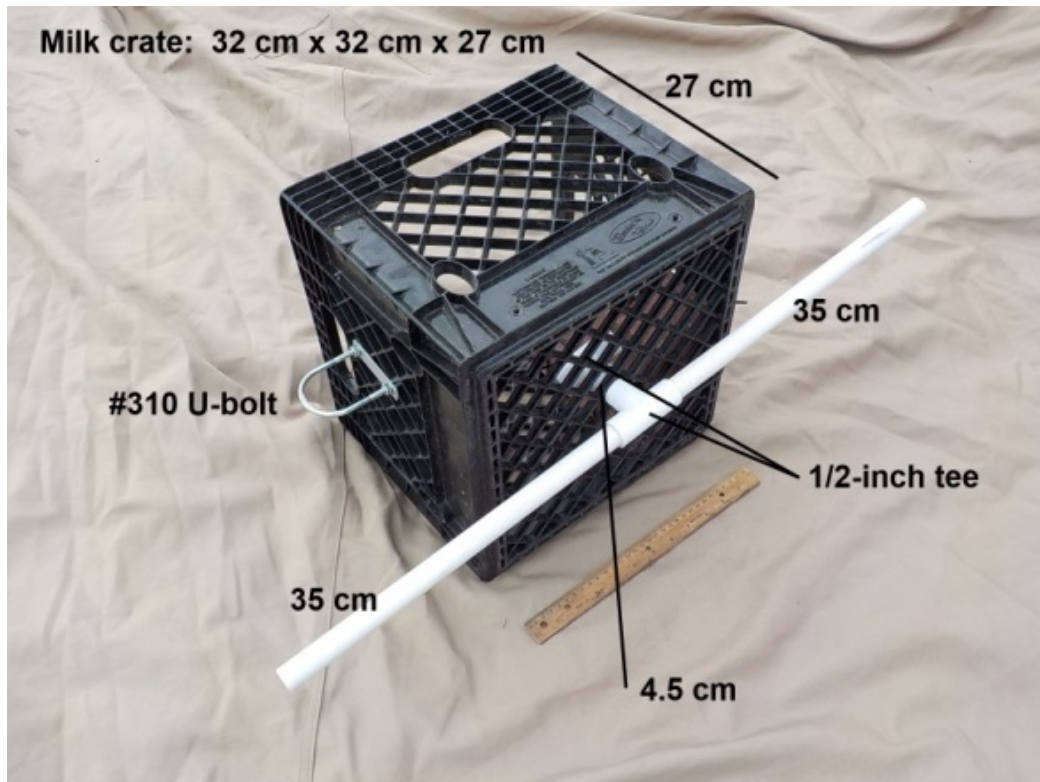
Engine, inside:



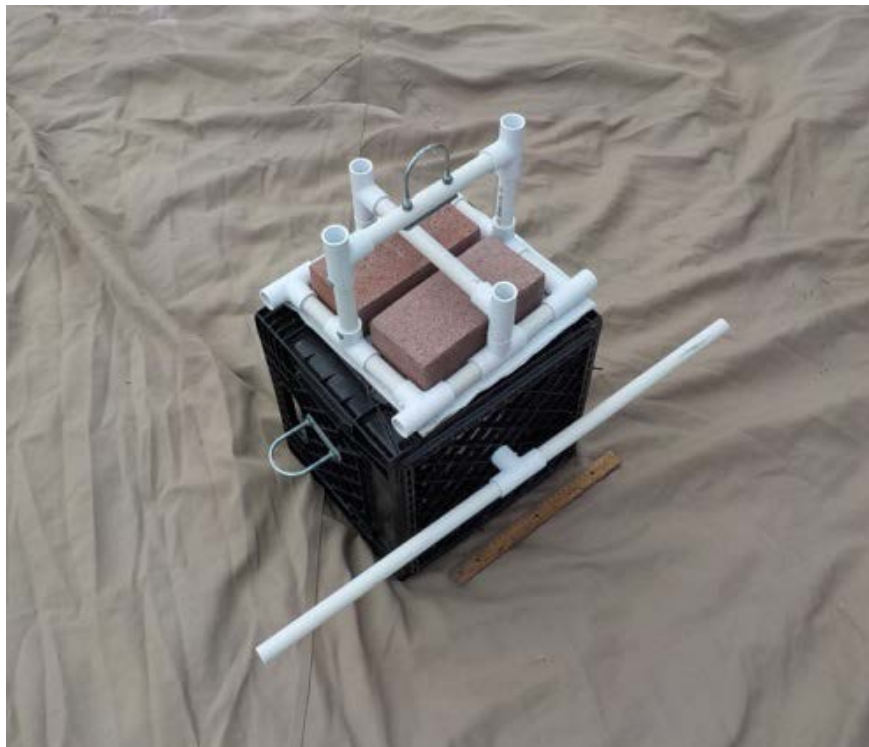
The milk crate is 32 cm x 32 cm x 27 cm.

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

The engine, propeller side:

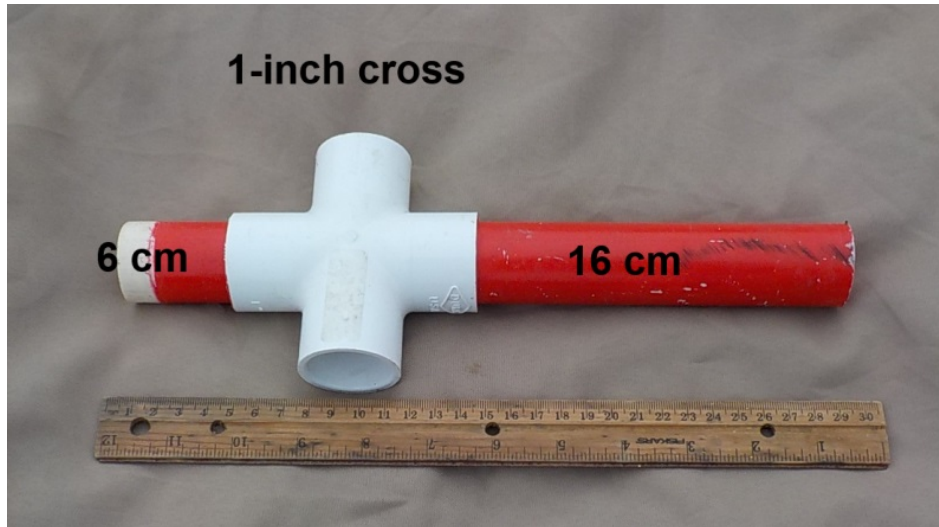


The debris on the engine:



Task 2: Earthquakes

Cable connector base:

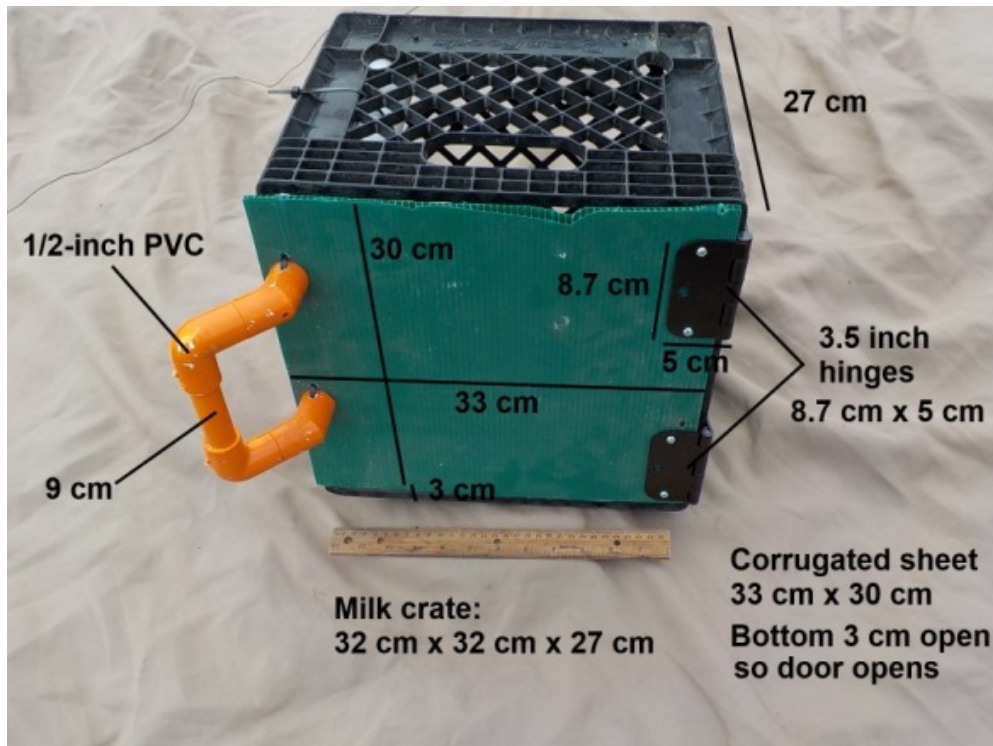


1-inch PVC is the base for building the cable connector.

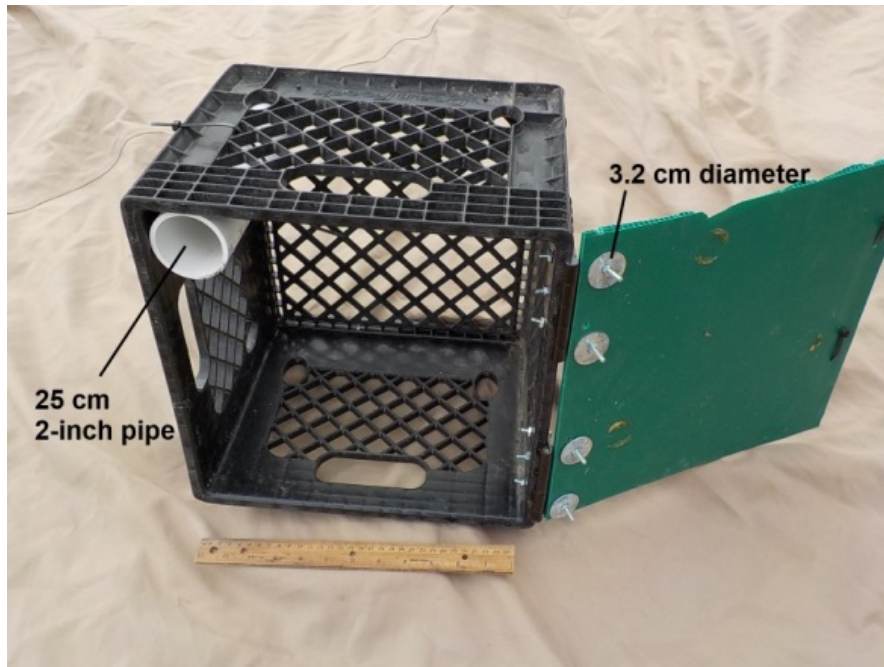
Companies may attach grab points or other means to carry the connector.

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

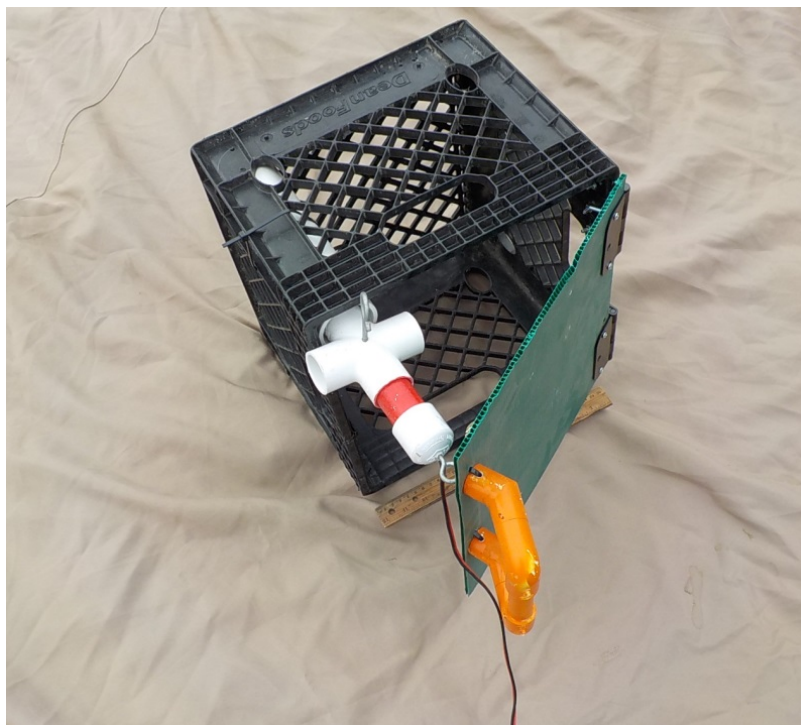
Power and communications hub, door closed:



Power and communications hub, door opened:



Power and communications hub, connector installed:

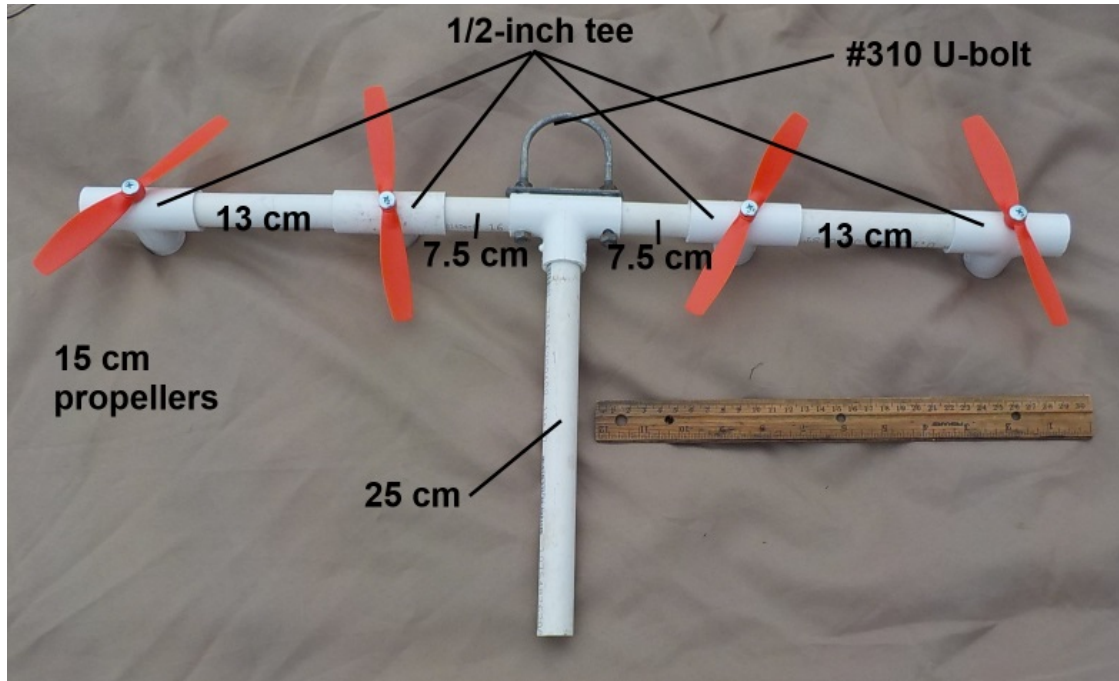


A connector installed into the power and communications hub.

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.

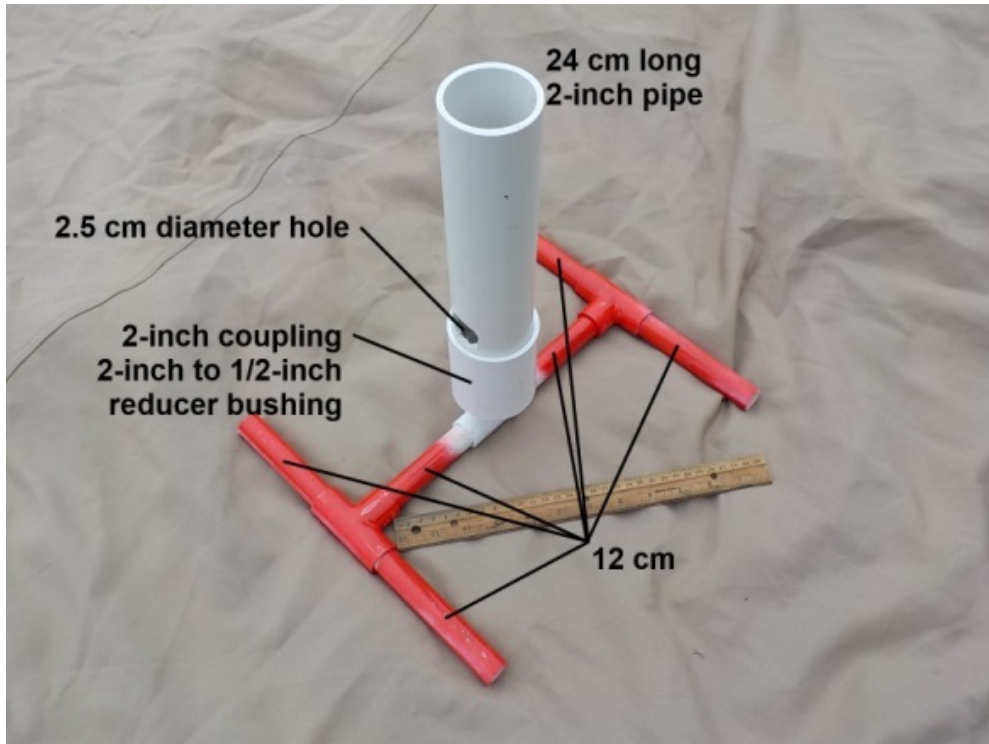
A red stripe (red plastic tape) will be added approximately 8 cm from the bottom of the tidal turbine.

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

Turbine base with latching mechanism:

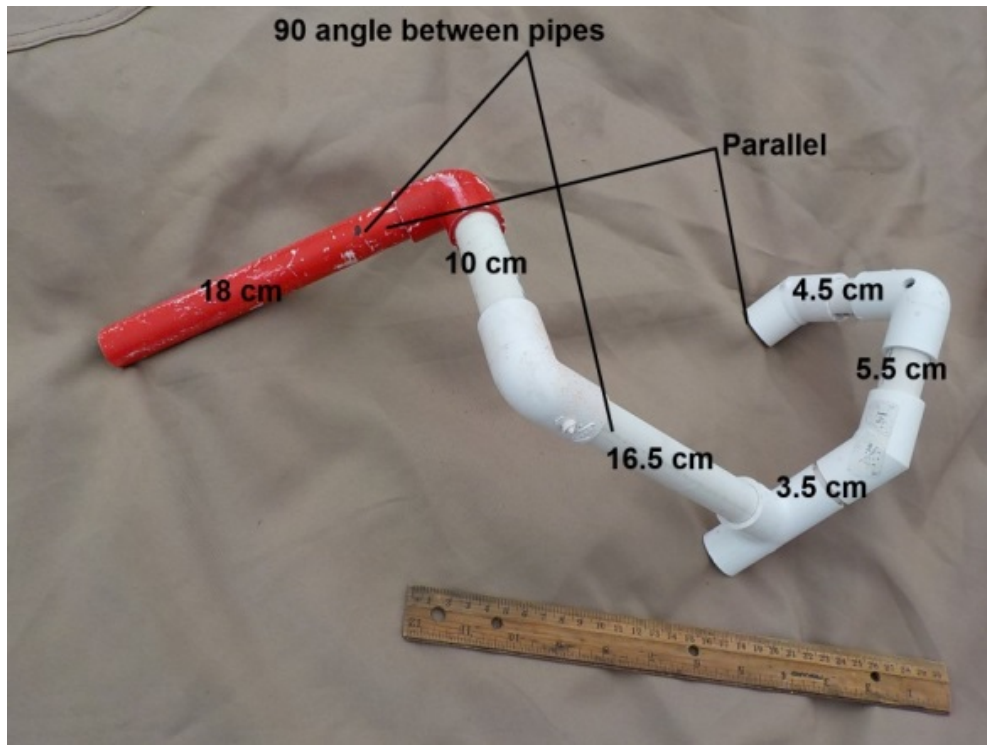


Turbine base without latching mechanism:



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

Turbine base latching mechanism:



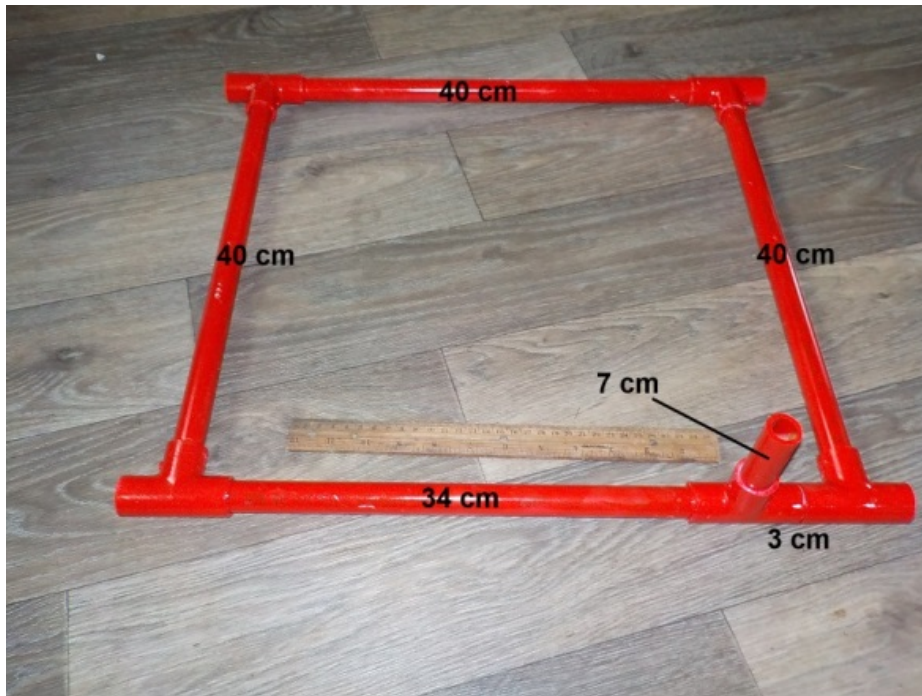
The 10 cm length of pipe fits through the 2.5 cm holes drilled into the base.

Turbine base with tidal turbine installed and latched:

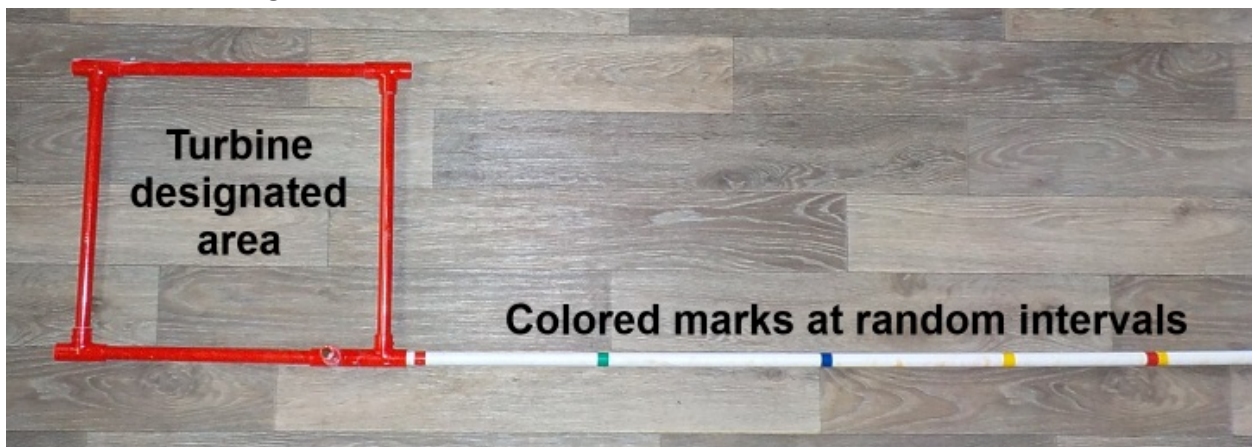


The latch handle has been rotated to bring the latch up against the tidal turbine in the base.

Turbine area:



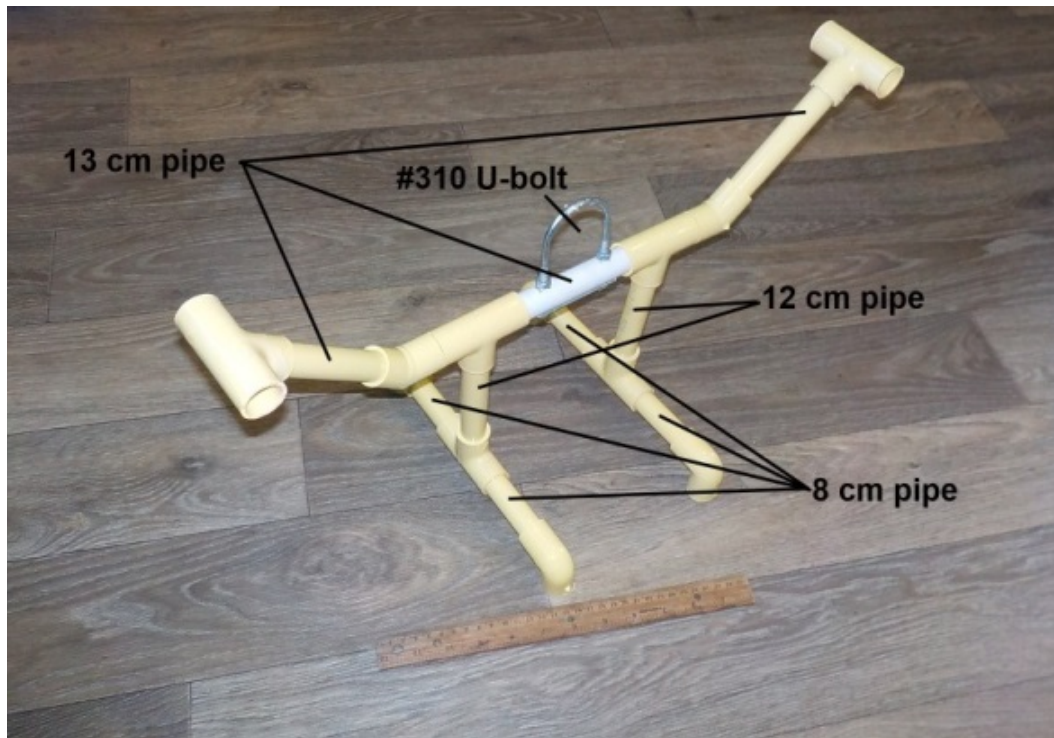
Turbine area with length measurement:



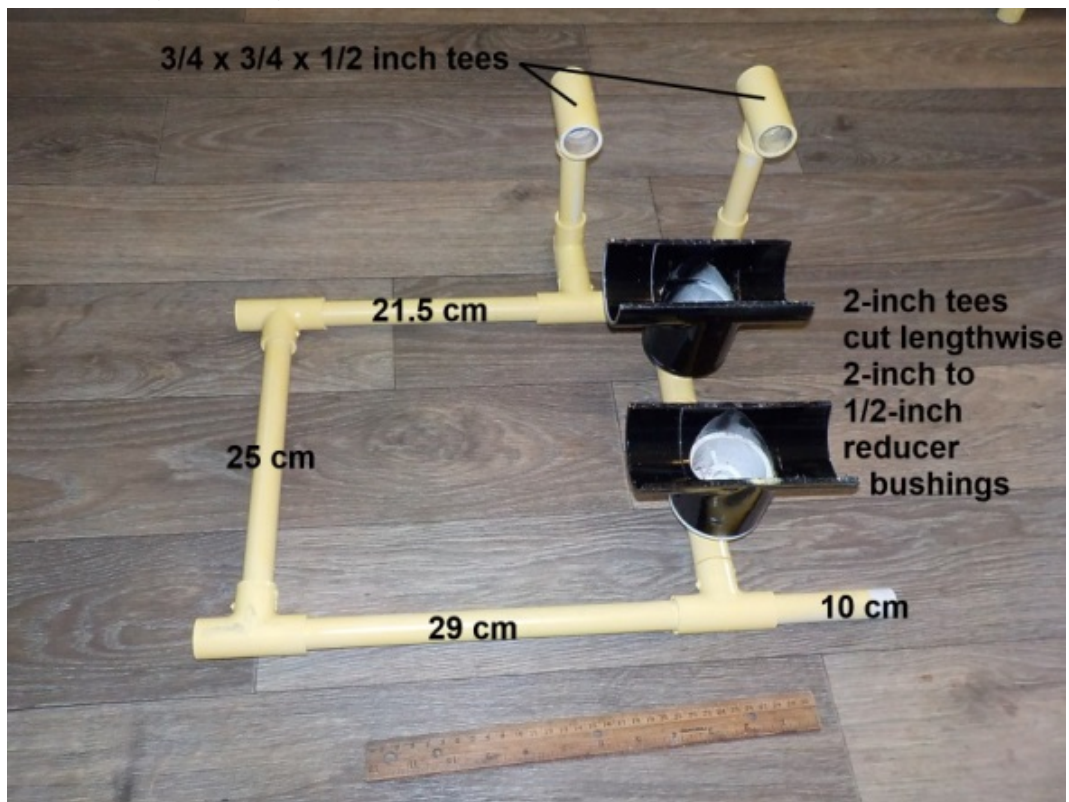
The turbine area will be painted red matching the red painted base of the tidal turbine.

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

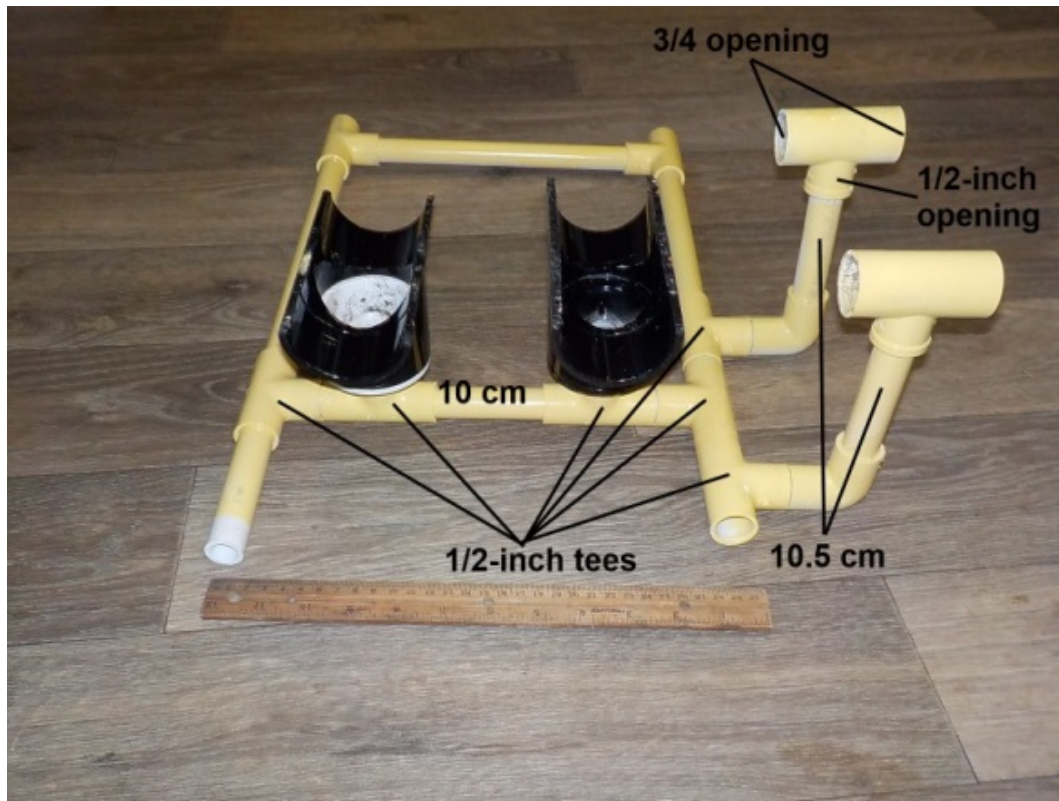
I-AMP:



I-AMP base (side view):



I-AMP base (front view):



I-AMP locking mechanism:



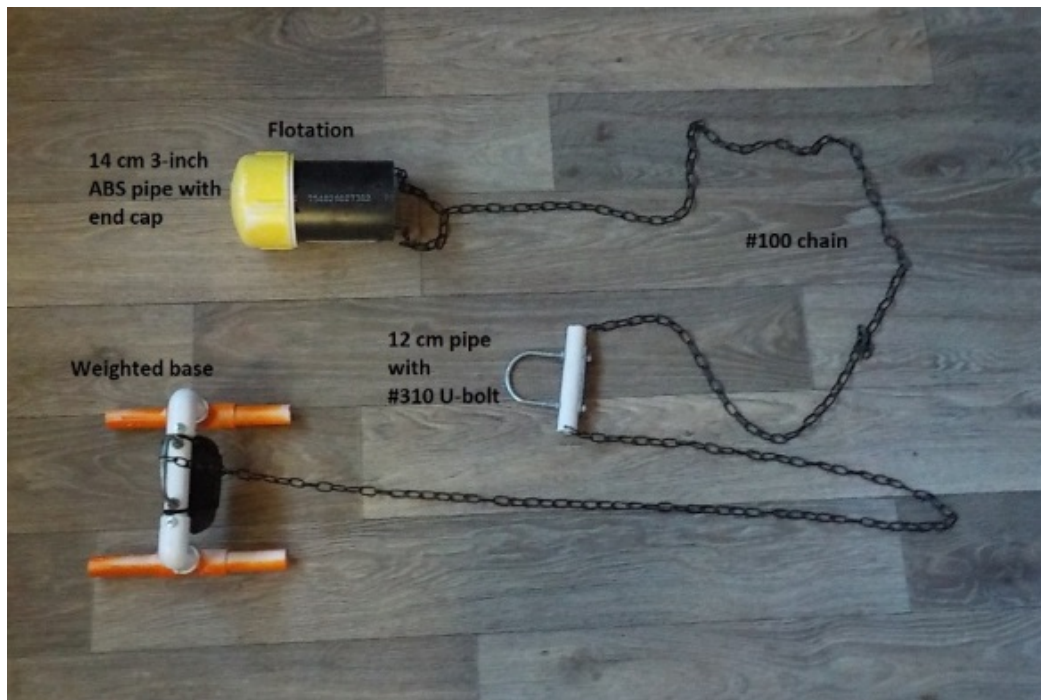
After inserting the locking mechanism through the $\frac{3}{4}$ -inch tees, attach two 90° elbows to the two ends.

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.

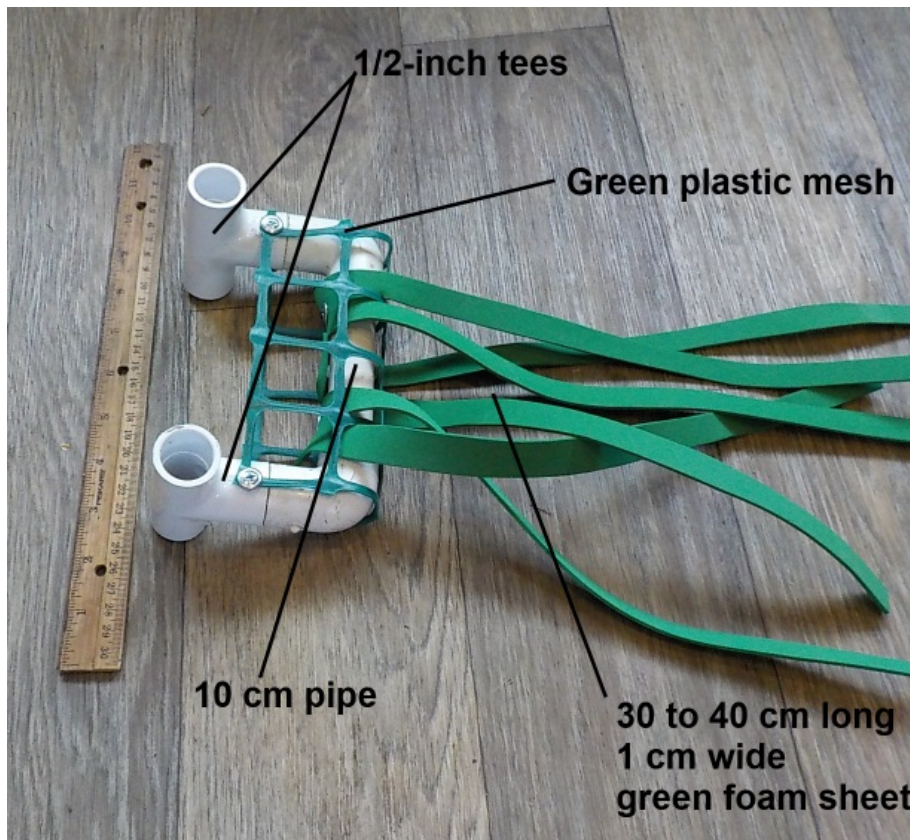
The flotation should be 3 Newtons positively buoyant in water.

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.

Eelgrass area:

