

# EXPLORER Product demonstration prop building instructions

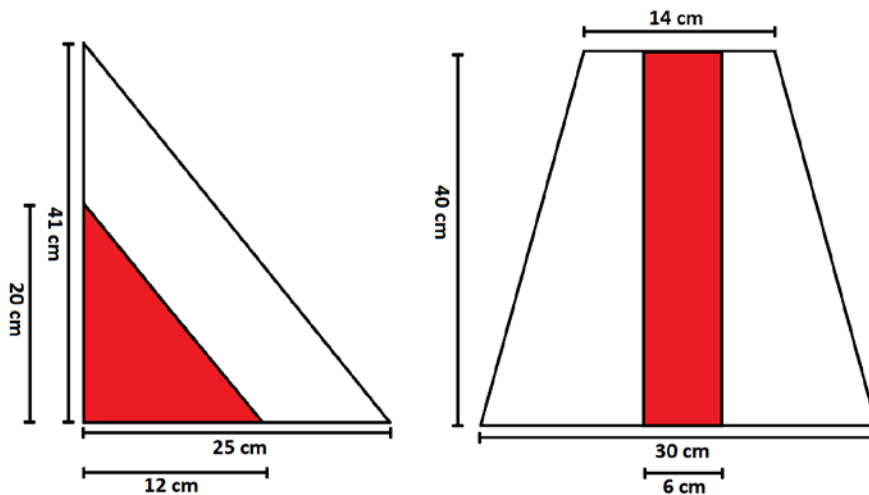
Solidworks files are available for all product demonstration props. Contact the [MATE competition coordinator](#) for access to the RANGER SolidWorks files. [SolidWorks Student Edition](#) is free for MATE competitors. The [eDrawings Viewer](#) is a free download that allows the Solidworks files to be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

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

See last page for update notes.

## Task 1: Aircraft

Tail:

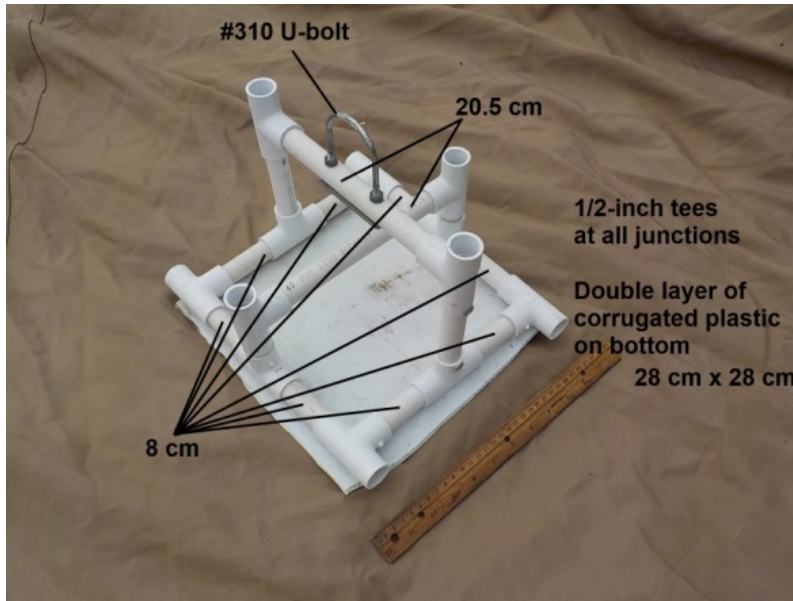


The aircraft tail structure will be constructed from corrugated plastic sheeting (check sign stores for sheeting).

The sheeting will be attached to ½-inch PVC pipe.

See the [EXPLORER Aircraft Identification Handbook](#) for additional dimensions, shapes, and photos of each tail structure.

**Debris:**



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

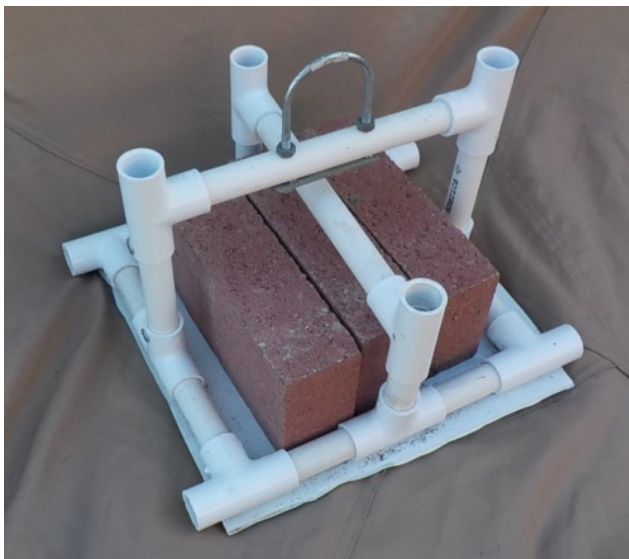
Three [bricks](#) (19 cm x 9 cm x 5.5 cm) are positioned inside the ½-inch PVC frame.

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

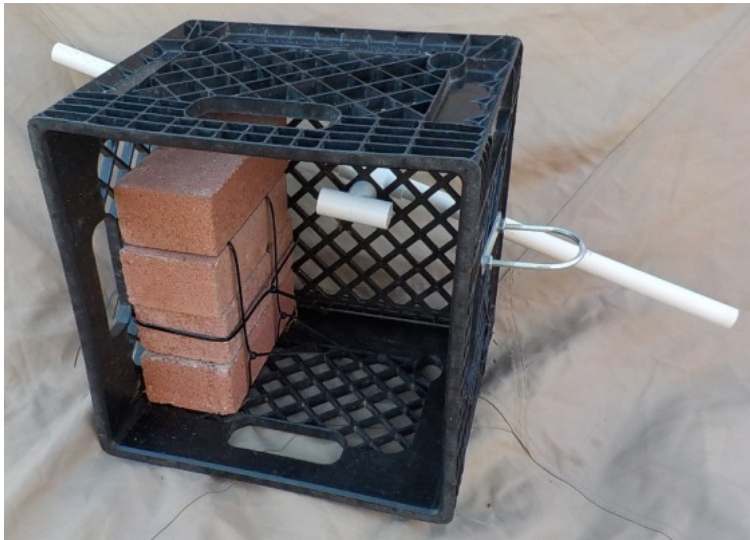
Use at least eight screws to secure the double sheet of corrugated plastic onto the bottom of the PVC frame.

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

**Debris with weight:**



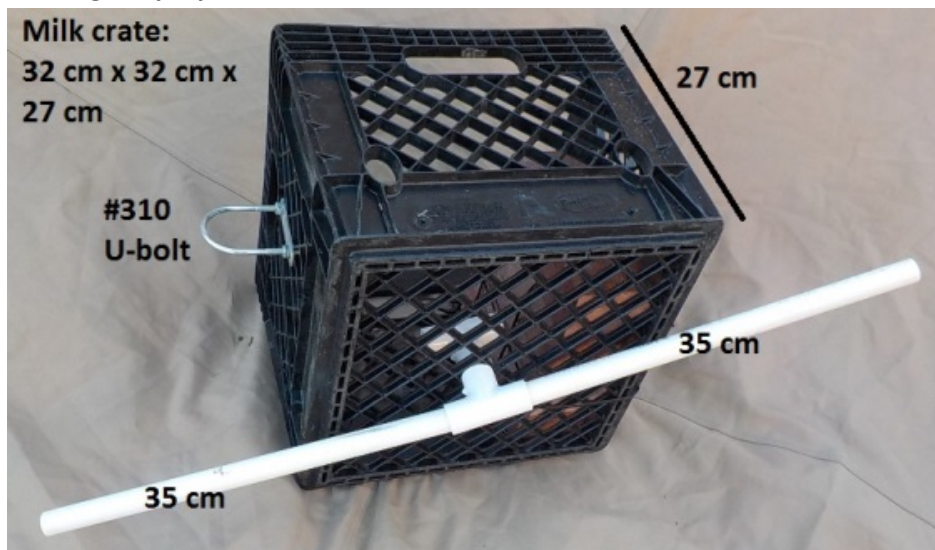
**Engine, inside:**



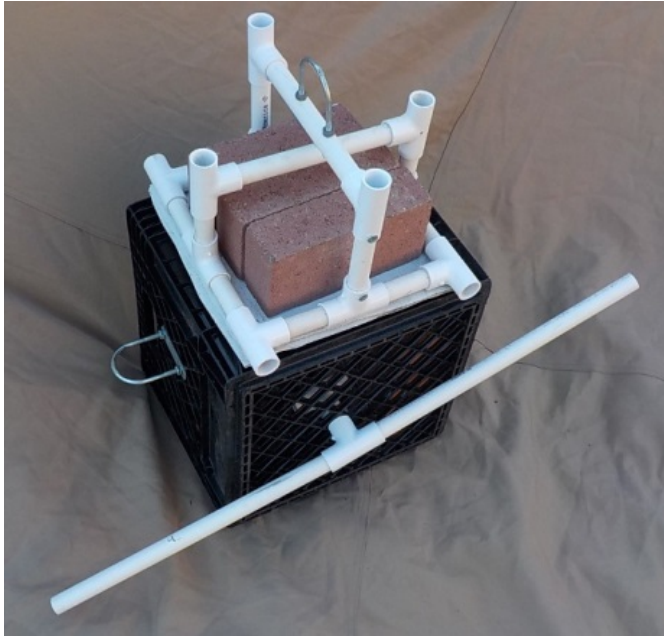
The milk crate is 32 cm x 32 cm x 27 cm.

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

**The engine, propeller side:**



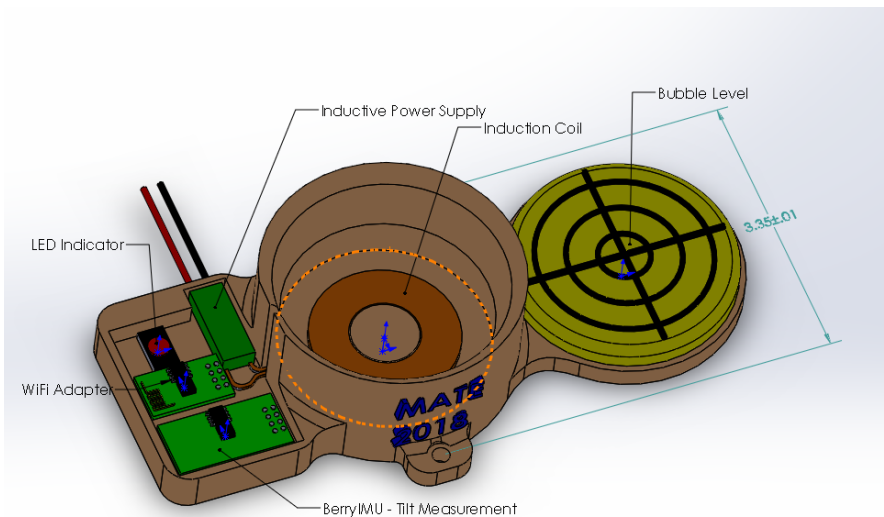
The debris on the engine:



## Task 2: Earthquakes

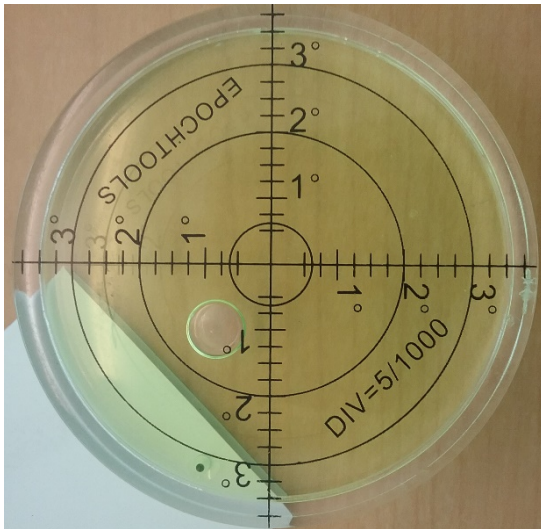
Inductive coupling port:

The file for 3D printing the port is available with the SolidWorks files.



Note: The Berry IMU – Tilt Measurement has been replaced by the LSM303 Compass module (see below). The Berry IMU will not be used.

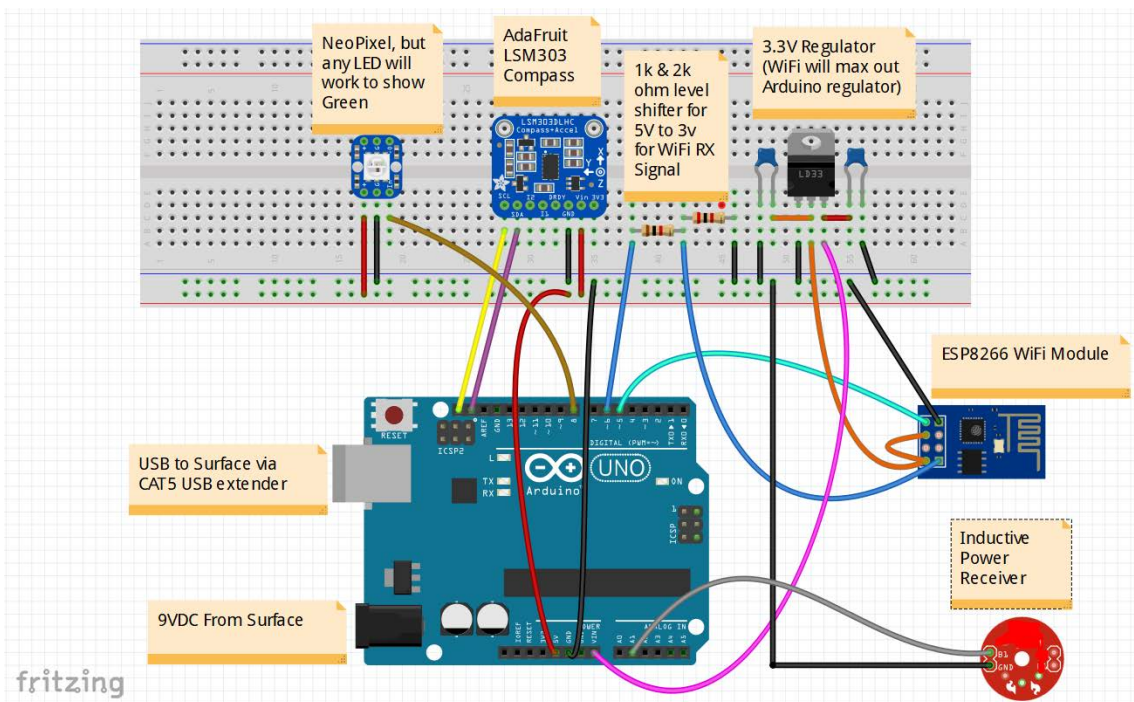
The bubble level:



**Connections and parts for the OBS electronics package:**

The LED, power receiver module, WiFi module (adapter) and compass are mounted on the 3D printed port.

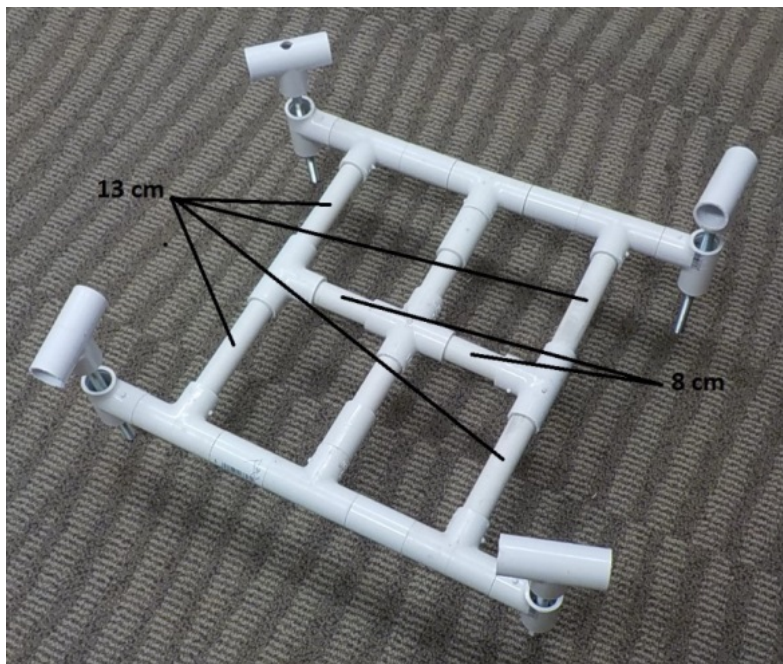
The remaining items are contained within a waterproof housing.



### Parts to construct the OBS electronics:

- [LED: NeoPixel](#)
- [WiFi: ESP8266 Esp-01](#) (also available at Digikey.com and Sparkfun.com)
- [Compass: LSM303 Module](#) AdaFruit #1120 (also available on Amazon.com and Digikey.com)
- [3.3V Regulator LD1117-3.3](#) AdaFruit (also available on Amazon.com and Digikey.com)
- [USB CAT5 Extender](#)
- [Wireless Charger Set 5VDC](#)
- 1k ohm resistor
- 2k ohm resistor
- 2ea 0.1uF capacitors
- Arduino board (Uno, Nano, Micro, Mega will all work fine)
- The regulator is required because the WiFi module will draw more current than is available on the Arduino 3.3V regulator.
- The Arduino is provided with 9V from the surface and the input to the 3.3V regulator is picked up from the Vin pin on the Arduino.

### **OBS frame**



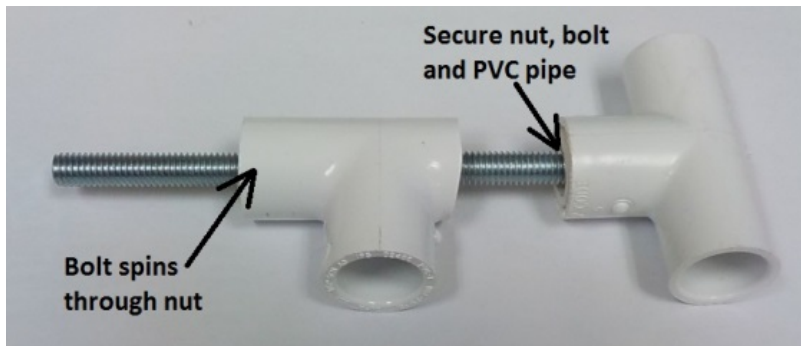
The inductive coupling port will be mounted on top of the framework.

The electronics housing will be mounted underneath the framework.

[Rubber tips](#) on the bottom end of the bolts will keep the legs from damaging pool tiles.

The electronics housing will contain the other electronic components of the OBS not mounted on the port.

### OBS leg:

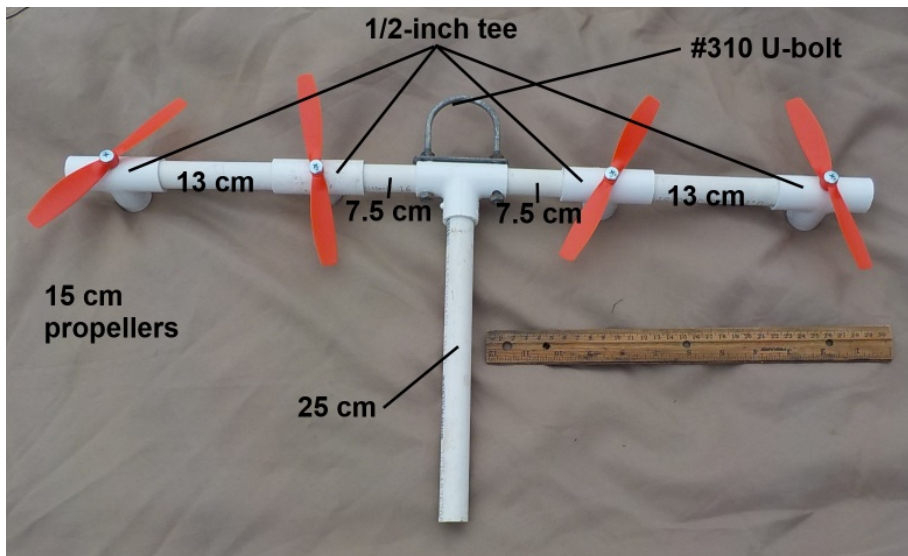


Use glue or solder to secure the 6-inch bolt inside the tee.

Use glue to secure the short length of 1/2-inch pipe inside the tee.

### Task 3: Energy

#### Tidal turbine:



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

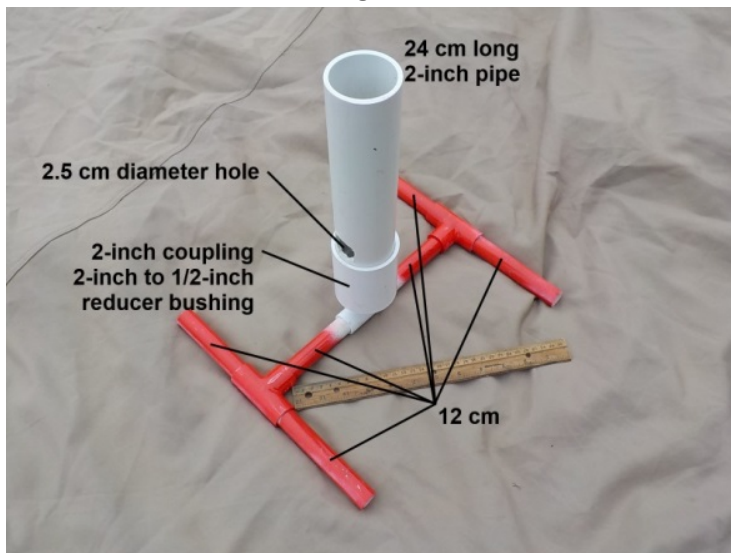
A red stripe (red plastic tape) will be added approximately 8 cm from the bottom of the tidal turbine.

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

**Turbine base with latching mechanism:**



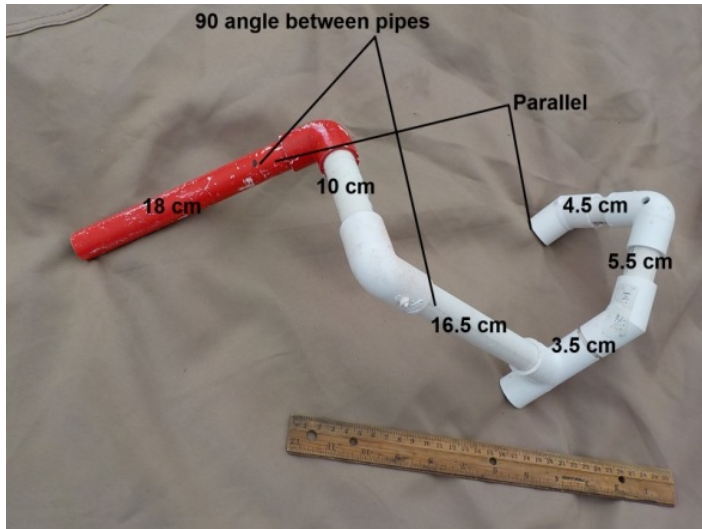
**Turbine base without latching mechanism:**



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



**Turbine base latching mechanism:**



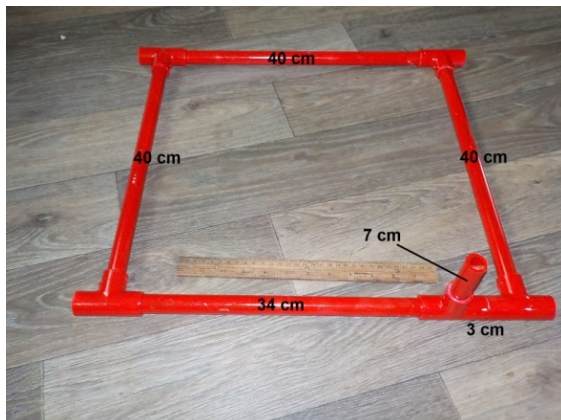
The 10 cm length of pipe fits through the 2.5 cm holes drilled into the base.

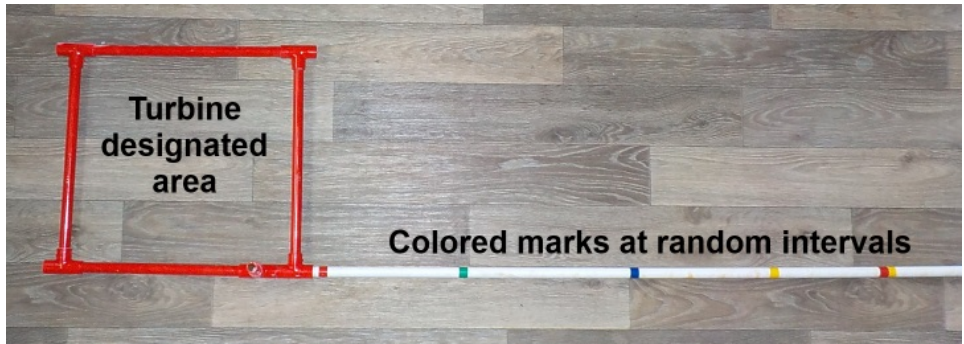
**Turbine base with tidal turbine installed and latched:**



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

**Turbine area:**

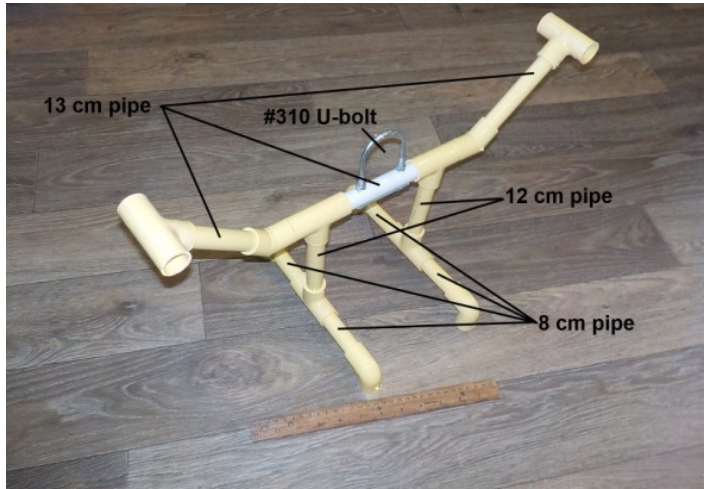




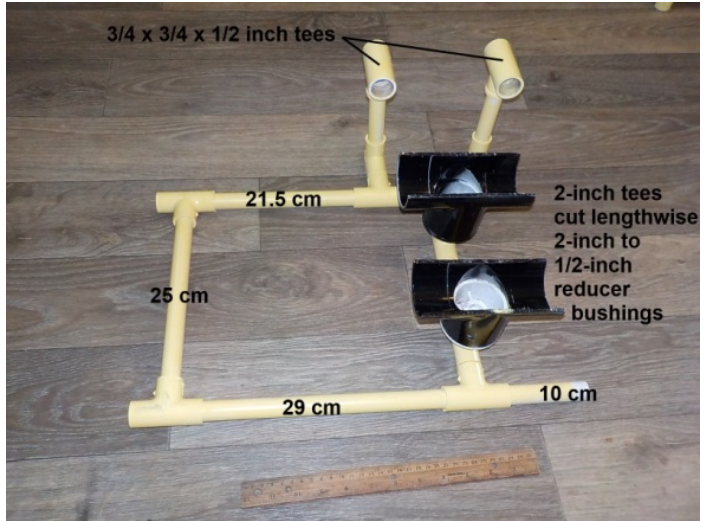
The turbine area will be painted red matching the red painted base of the tidal turbine.

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

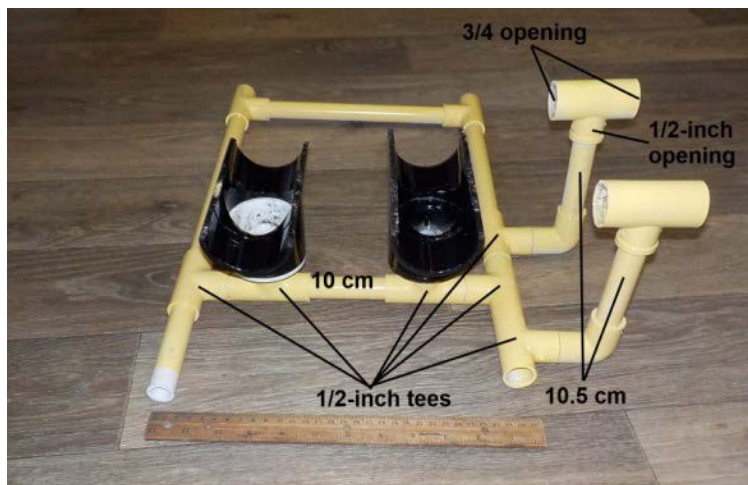
**I-AMP:**



**I-AMP base, side view:**



**I-AMP base, front view:**



**I-AMP locking mechanism:**



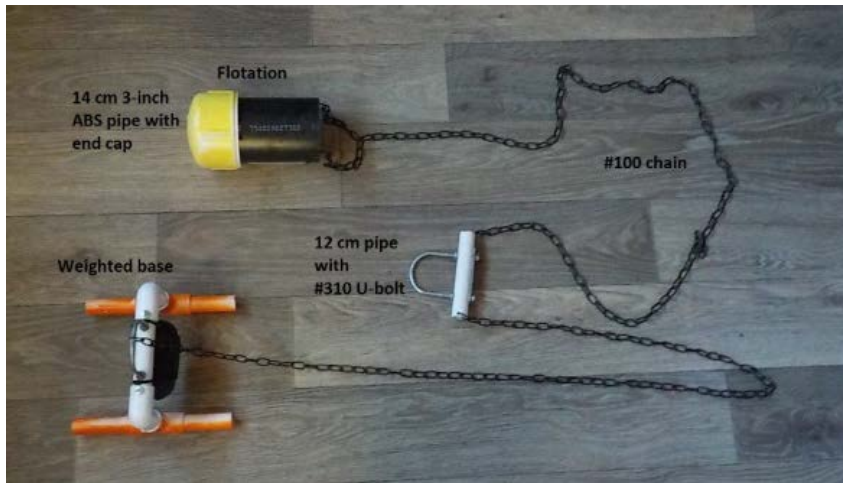
After inserting the locking mechanism through the 1/2-inch tees, attach two 90° elbows to the two ends.

**I-AMP locked onto the base:**



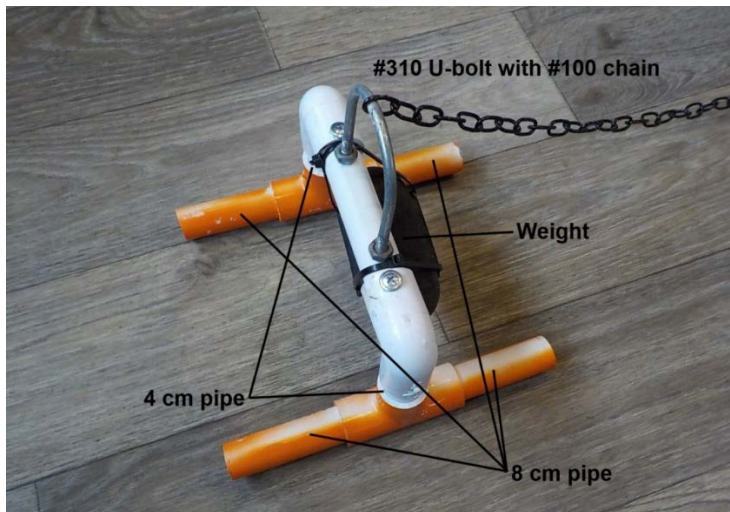
The feet of the IAMP must be within the 2-inch cradles (painted black).

### 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:



A 2-lb. dive weight is secured with zip ties to the base of the mooring.

### 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.

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 6: Removal of Berry IMU

Page 16: Added additional notes