

EXPLORER product demonstration prop building instructions

For companies attending an EXPLORER class regional event, regional competitions may build product demonstration props out of materials other than PVC pipe. Your regional coordinator will inform you of any changes to materials for your regional competition. NOTE: Look for a regional information document posted on your [regional website](#). This document will list any changes to the product demonstration props.

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 given in this document for a product demonstration prop be used to calibrate a measuring device.

Online links and Home Depot part numbers are given for certain construction items. However, some Home Depot stores may not carry the listed items or Home Depot may not be available in your area. MATE recommends checking other local hardware stores or online sources, such as those listed below, for the required component.

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

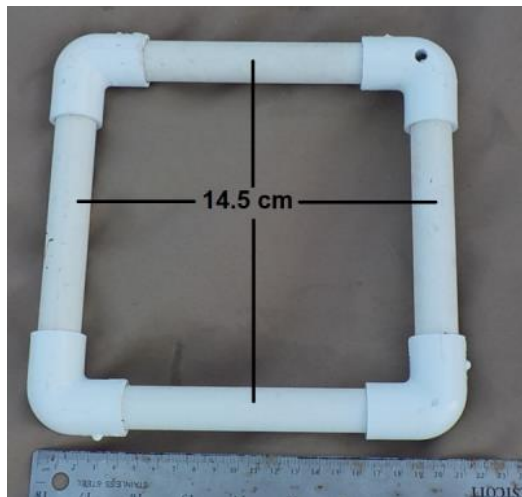
<https://pvcpipesupplies.com/pvc-fittings/schedule-40-pvc-fittings/>

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

See last page for update notes (if any).

Task 1: The Ubiquitous Problem of Plastic Pollution

The Seabin



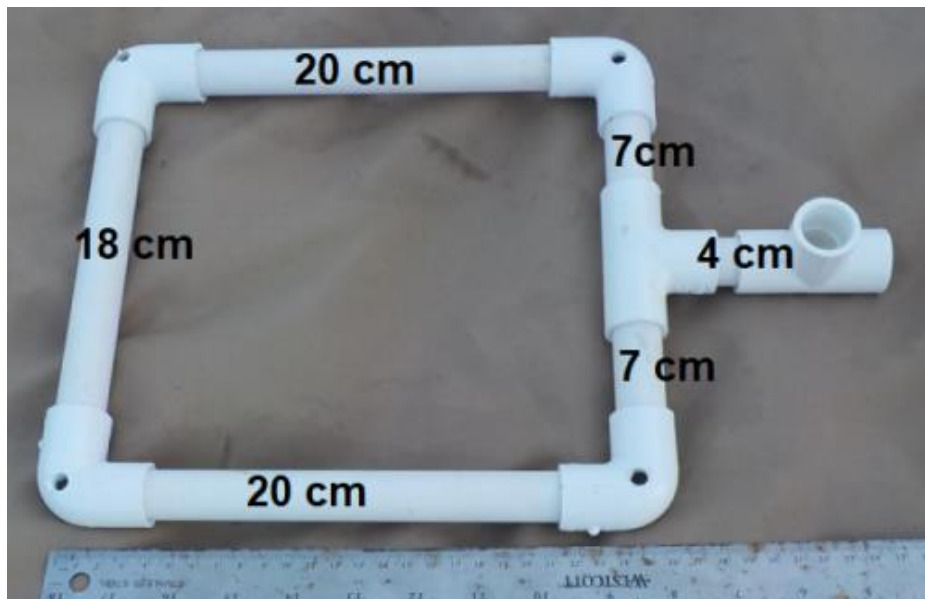
½-inch PVC framework inside the Seabin.



The ½-inch PVC framework is mounted inside the 5-gallon bucket of the Seabin. Screws are used to secure each corner of the framework approximately 5 cm down from the top of the bucket.



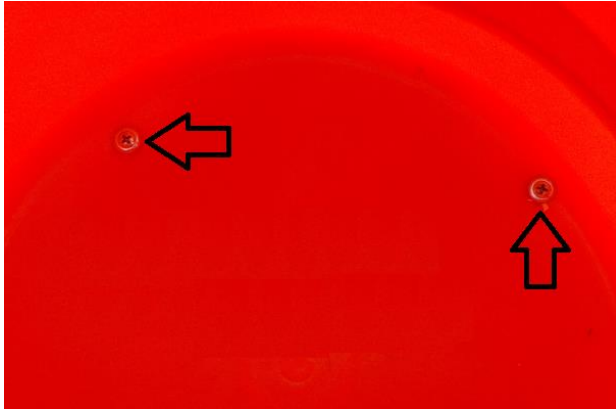
Flotation is added underneath the framework.



½-inch PVC framework for the bottom of the Seabin.



The framework is mounted to the exterior bottom of the 5-gallon bucket.

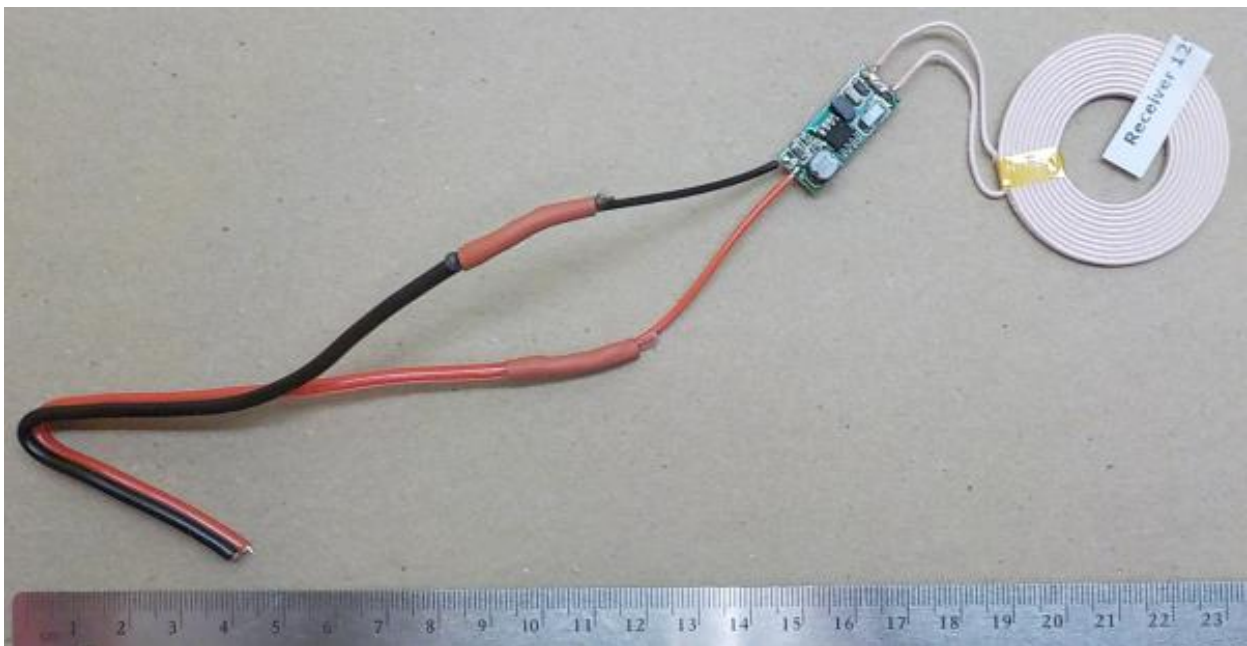


Screws are used to secure the framework to the exterior bottom of the bucket.

Powering the Power Port

Companies will be challenged to design and build an [inductive coupling power connector](#) that provides power to the Seabin.

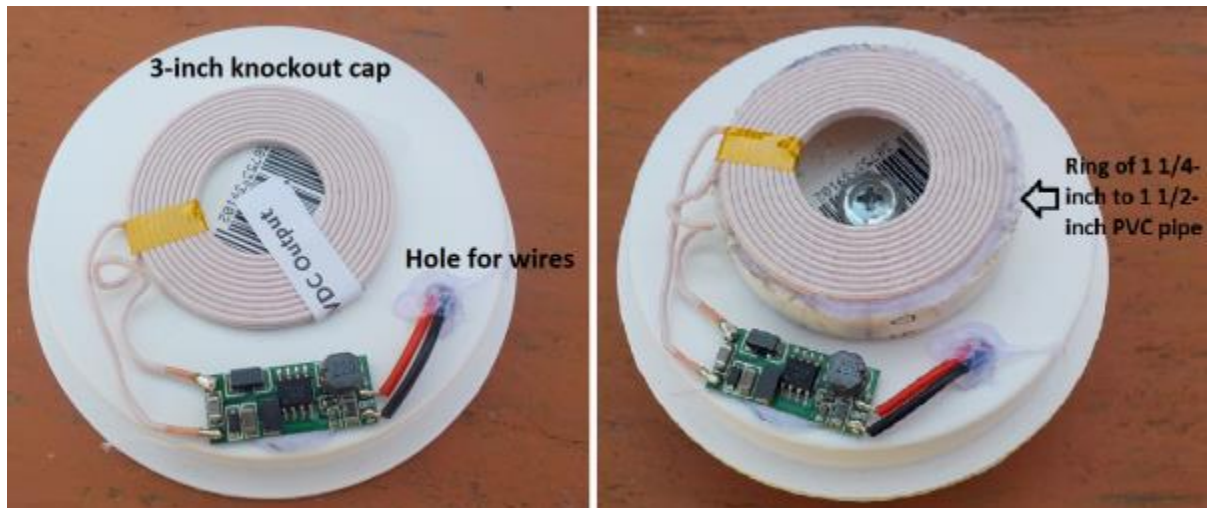
The instructions that follow show the construction of the powered port and the old connector. Companies may design and build their own new power connector to their own specifications.



15 cm red/black extension wires are soldered to the receiver side of the inductive coupling power connector. The solder joints are waterproofed.



The 3-inch knockout cap with 1/2-inch end cap attached.

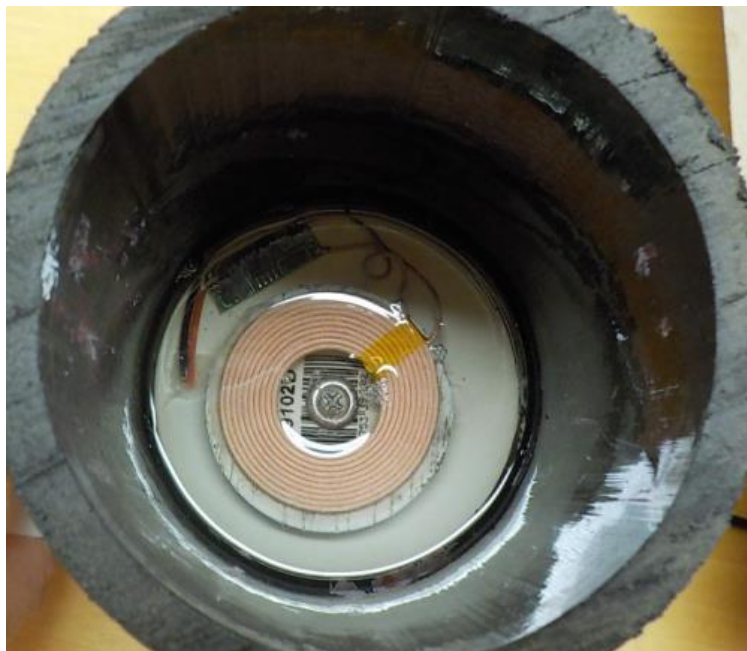


The receiver (output) side of inductive coupling power connector is mounted on the inside of a 3-inch knockout cap. Left: Note the hole for the wires to pass through the knockout cap and the hot glue to hold the electronics and wires in place. Right: A ring of 1 1/4-inch or 1 1/2-inch PVC pipe positions the coil above the electronics.



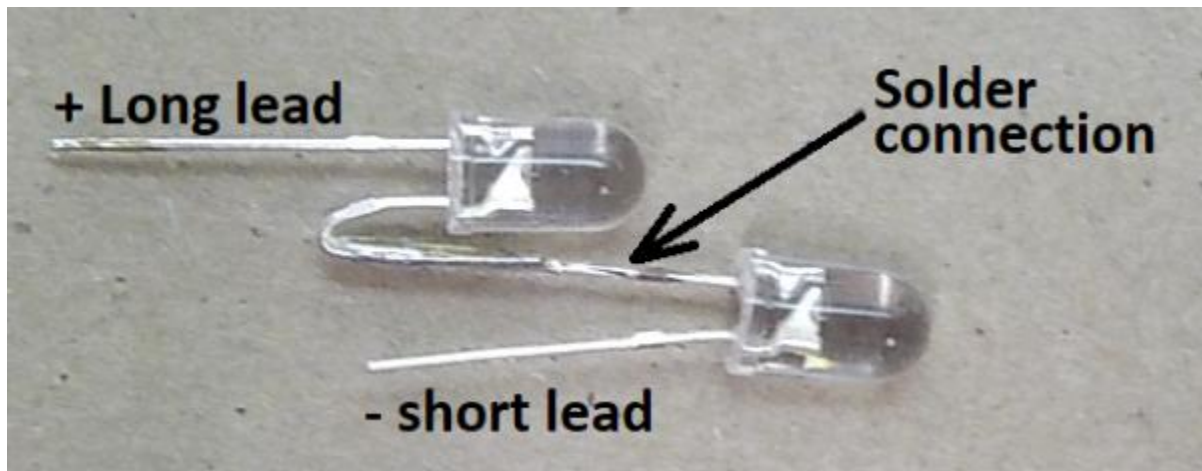
The power port side view.

A slow curing epoxy ([Envirotex Lite](#)) is used to waterproof the receiver side of the inductive coupling power connector. Note that fast curing epoxies may release enough heat to damage the electronics. The layer of epoxy should be as thin as possible (less than 2 mm) but still cover and waterproof all the electronics.



Power port electronics waterproofed.

Power Port LEDs



Two [LEDs](#) soldered together in series.



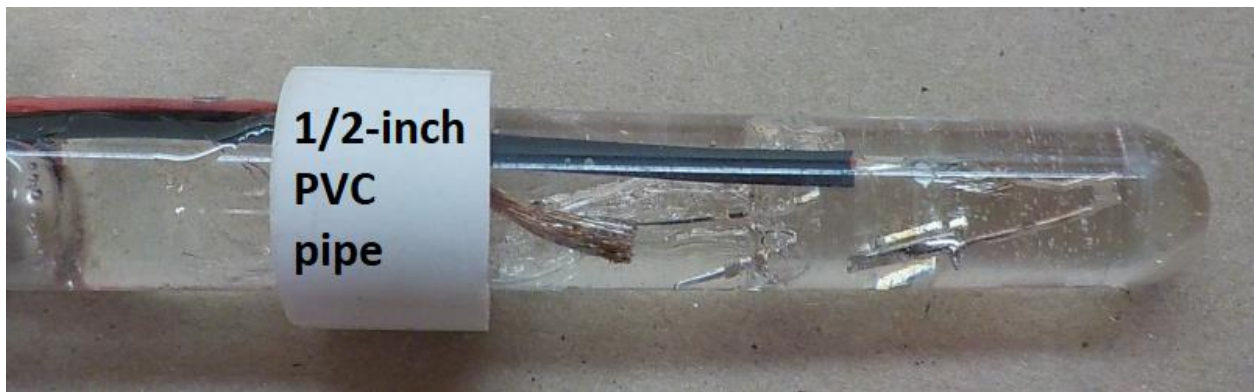
15 cm extension wires are soldered to the two LEDs.



The two LEDs inside a [plastic test tube](#). Note (make sure the wires and LED leads are not touching / shorting).



Epoxy ([Envirotex Lite](#)) waterproofing is added to test tube. Note that when the epoxy hardens, it will leave small lines and bubbles in the tube (as seen above).



A 1.5 cm ring of 1/2-inch PVC pipe is added to outside of test tube.



The 1/2-inch PVC ring is inserted into the side opening of a tee. The extension wires should be run through the middle opening of the tee and soldered to the receiver side of the inductive coupling power connector, which is located in the power port.

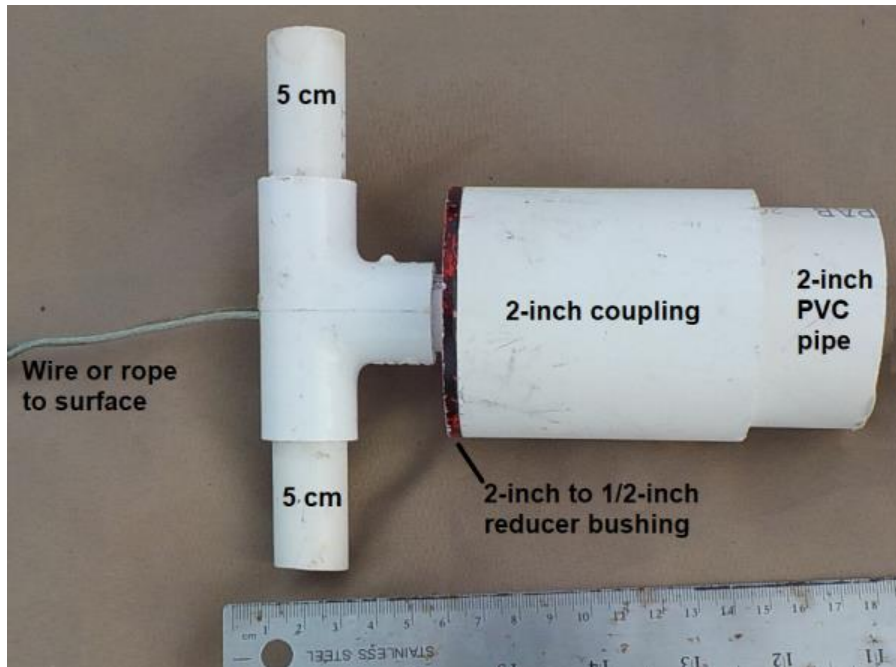


The power port with LED illumination attached to the Seabin.



Ropes will be used to secure the Seabin to a weight on the bottom of the pool. The top of the Seabin will be 30 cm to 50 cm beneath the surface of the pool.

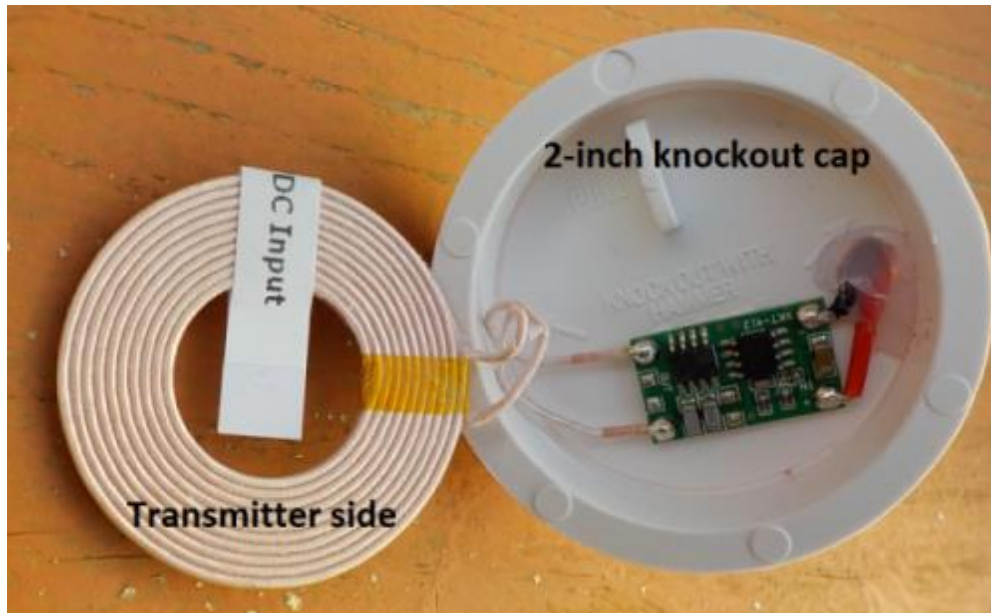
The Power Connector



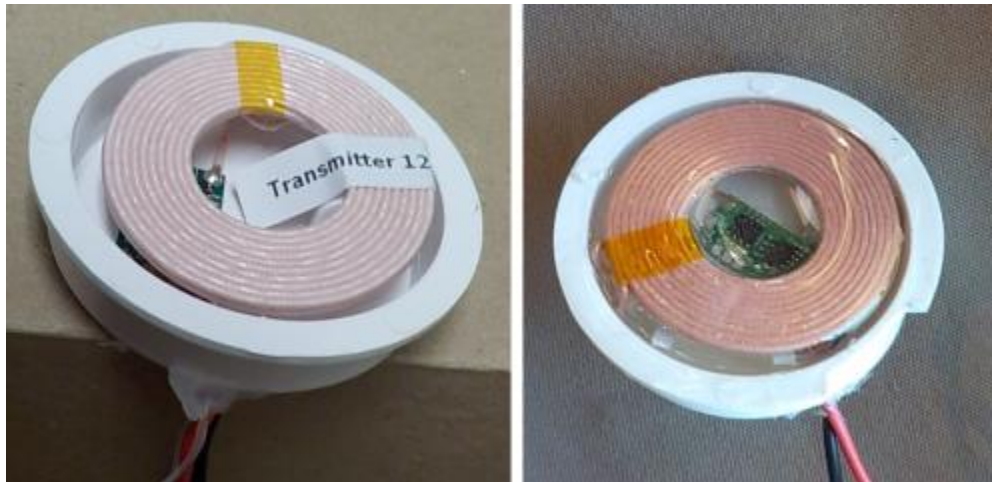
The old Seabin connector. The overall length is 18 cm. The width of the 2-inch coupling is 7 cm.



The power connector in the power port.



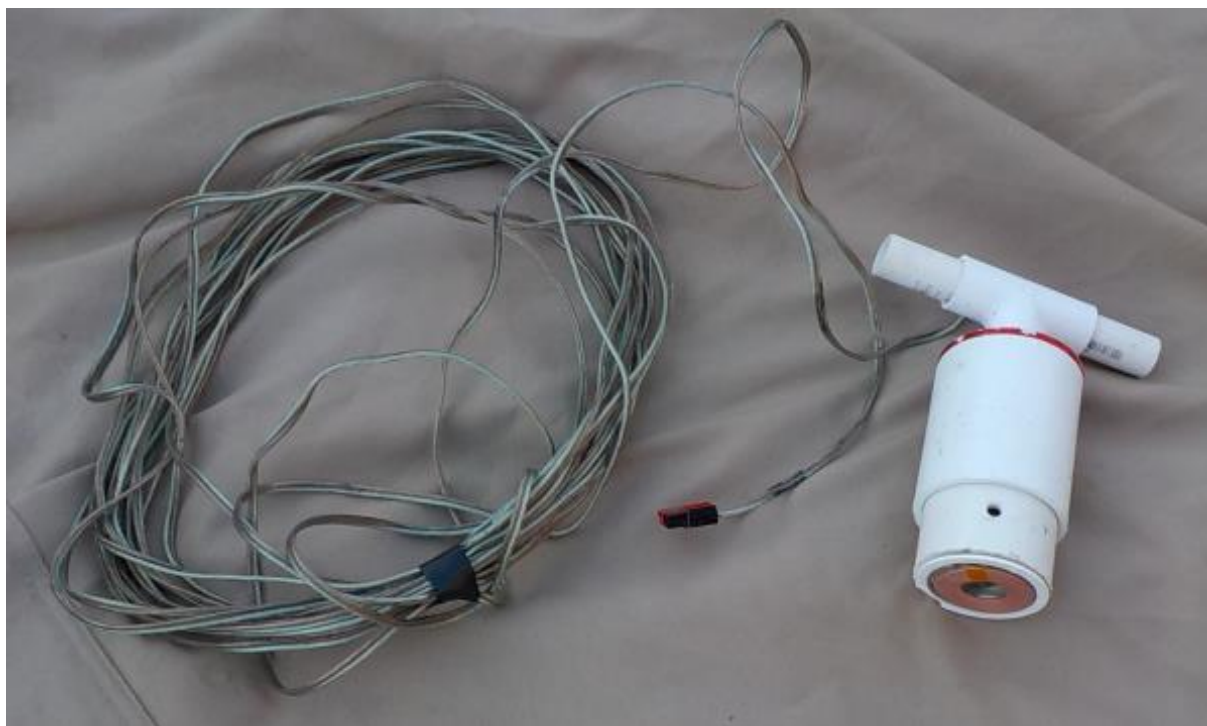
The transmitter side of the inductive coupling power connector in a [2-inch knockout cap](#). Note the wires pass through a hole in the knockout cap. Hot glue is used to seal the hole.



Left: The coil is raised above the electronics and flush with top of 2-inch knockout cap. Right: The coil is waterproofed with a slow curing epoxy ([Envirotex Lite](#)).

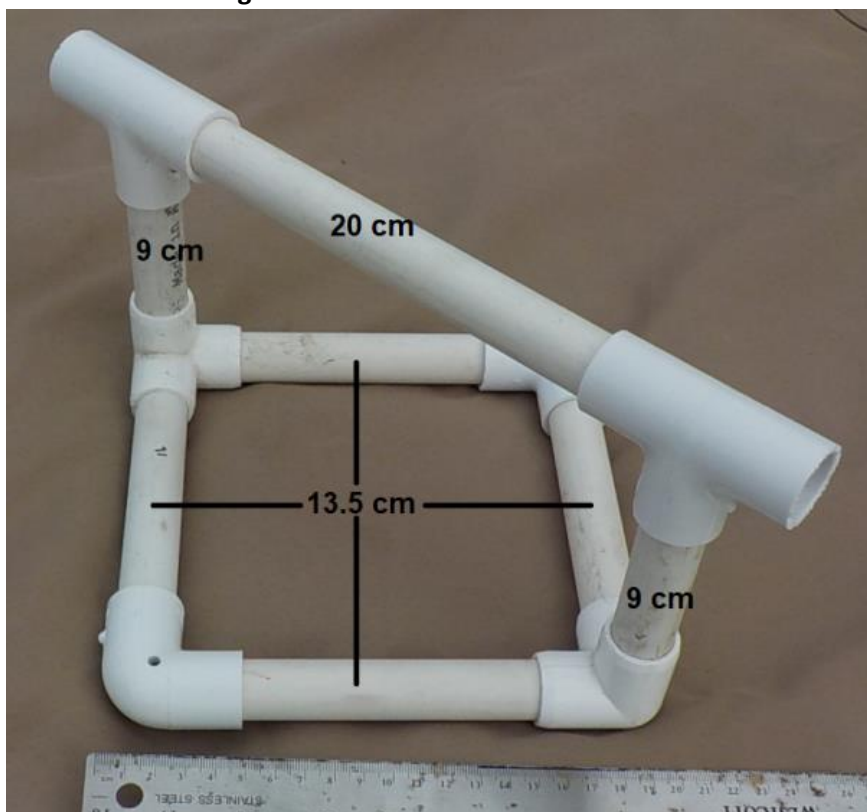


The transmitter side of the inductive coupling is attached to a wire that runs to the surface.
 Left: The solder connection is waterproof. Center: The wires pass through a hole in the 1/2-inch tee of the connector handle. Right: Anderson powerpole connectors are attached to the top end of the wire.

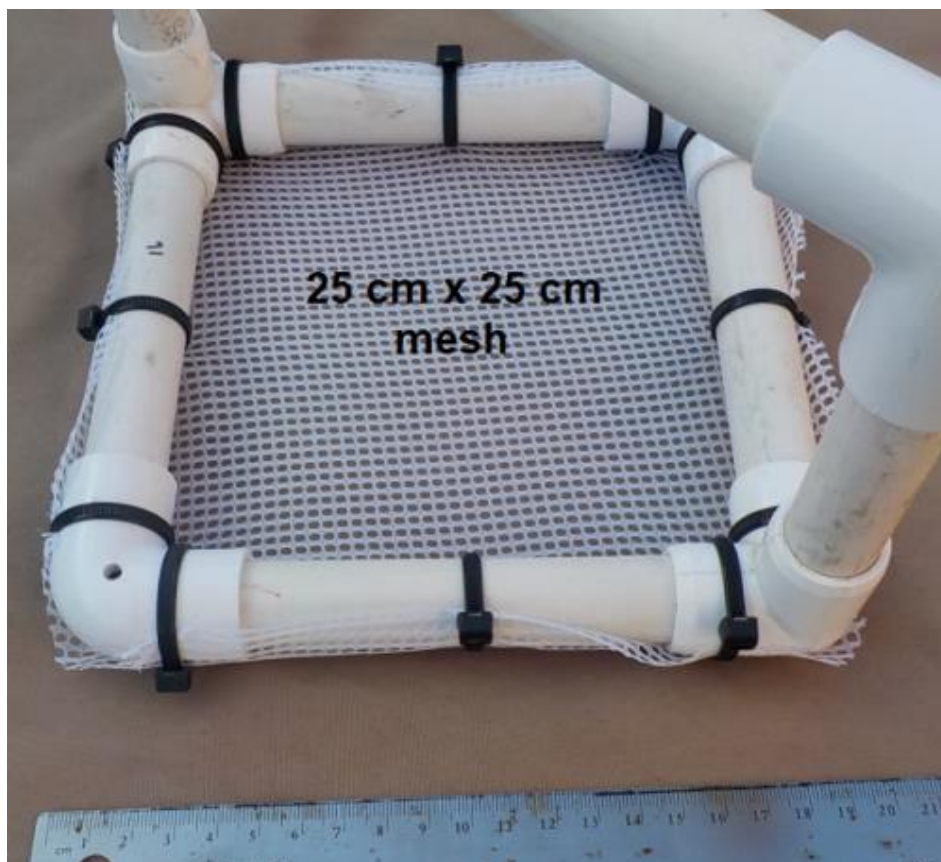


The MATE powered power connector.

The Mesh Catch Bag



The ½-inch PVC framework for the mesh catch bag.



The new [mesh](#) catch bag.

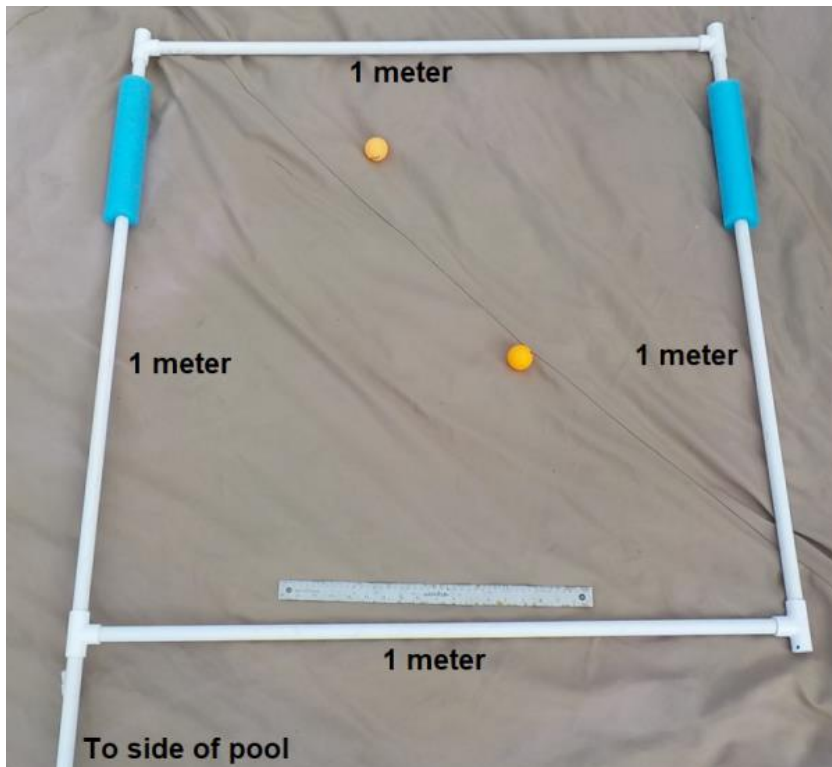


The old mesh catch bag with plastic debris.

Surface Debris



A ping-pong ball. The surface/floating plastic debris.



The PVC framework for holding the surface debris with two (of six) ping-pong balls shown.

The Ghost Net



The ghost net ½-inch PVC framework.



Left: The [decorative cloth netting](#) of the ghost net. Right: The decorative cloth netting is attached to the framework. Flotation is added to the top, and an 18 cm length of PVC is added to the bottom of the net for weight.



The ghost net pin.



Left: The ghost net is attached to the rope. Right: The pin runs through the holes in the PVC tee and through loop in the rope. The other end of the rope attaches to a weight on the bottom of the pool.

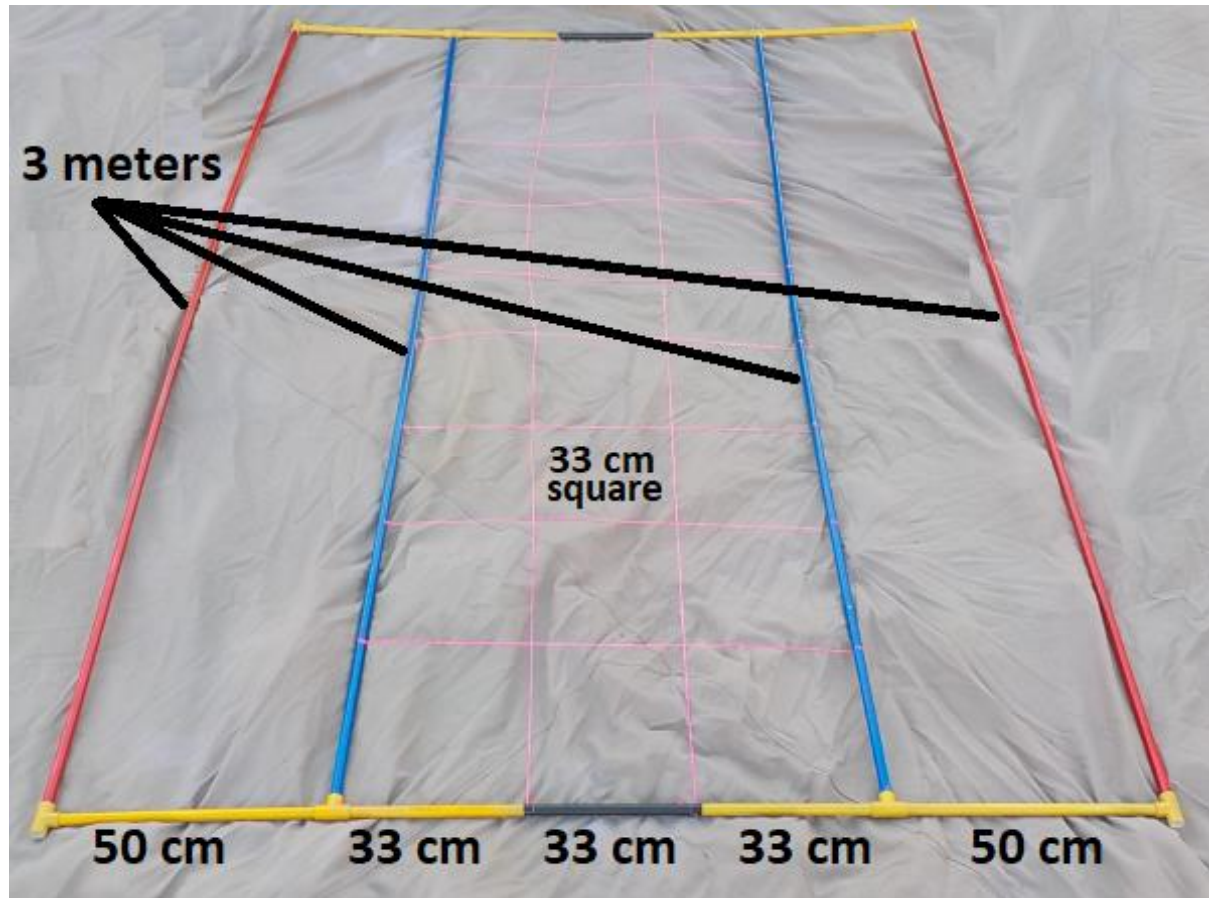
Bottom Debris



The bottom debris. A 1-gallon Ziploc bag with a 20 cm length of $\frac{1}{2}$ -inch PVC pipe attached inside with Velcro. Velcro hooks are on the bag side. Velcro loops are on the PVC pipe side.

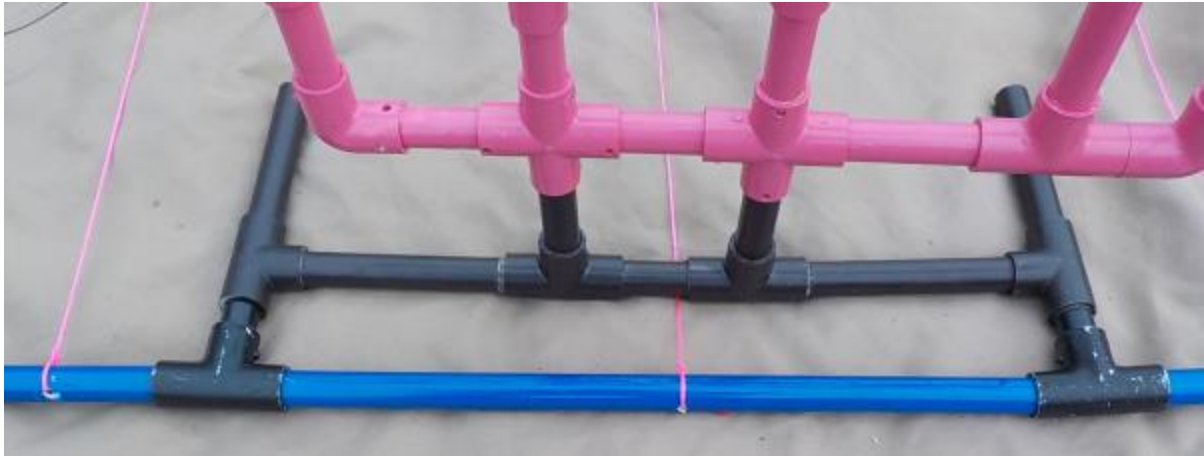
Task 2: The Catastrophic Impact of Climate Change on Coral Reefs

The Coral Reef



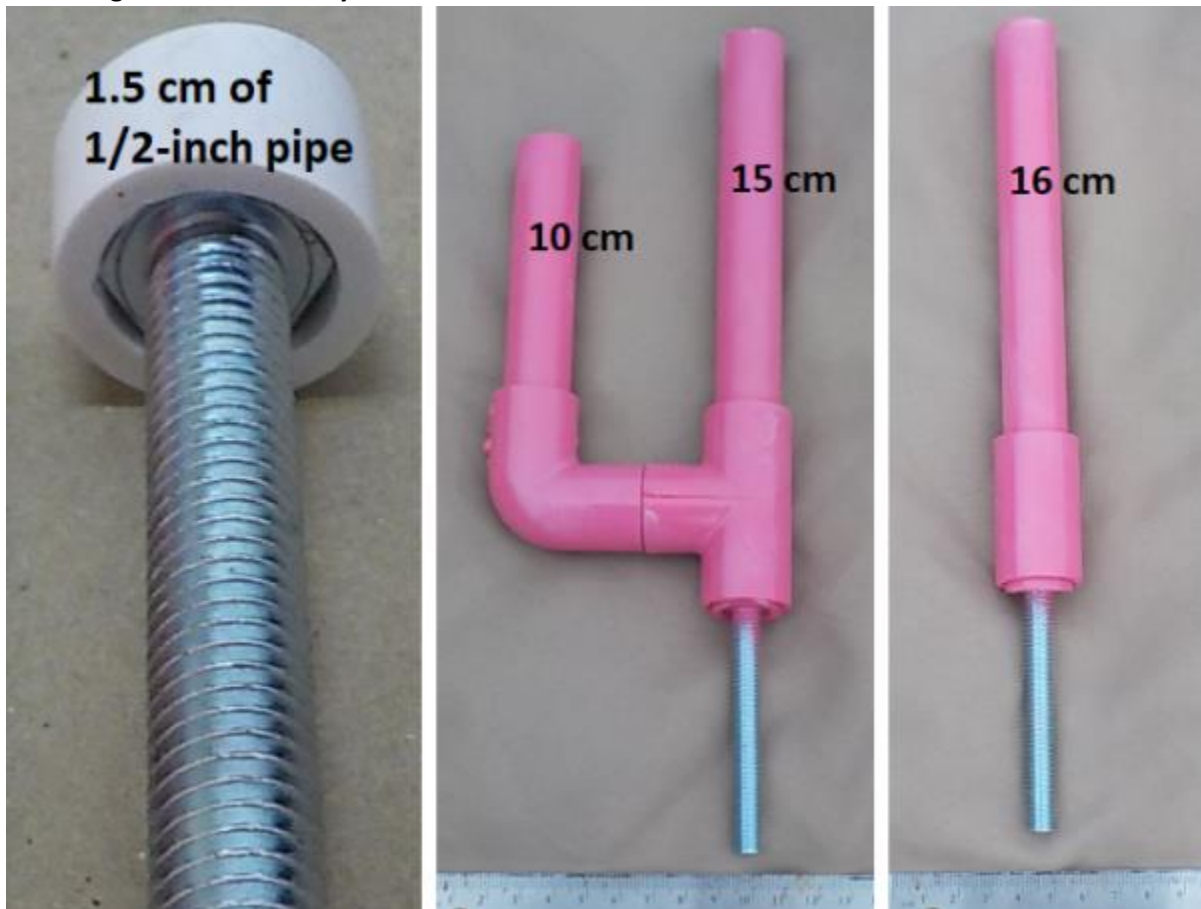
The coral reef.

2020 EXPLORER class prop building instructions

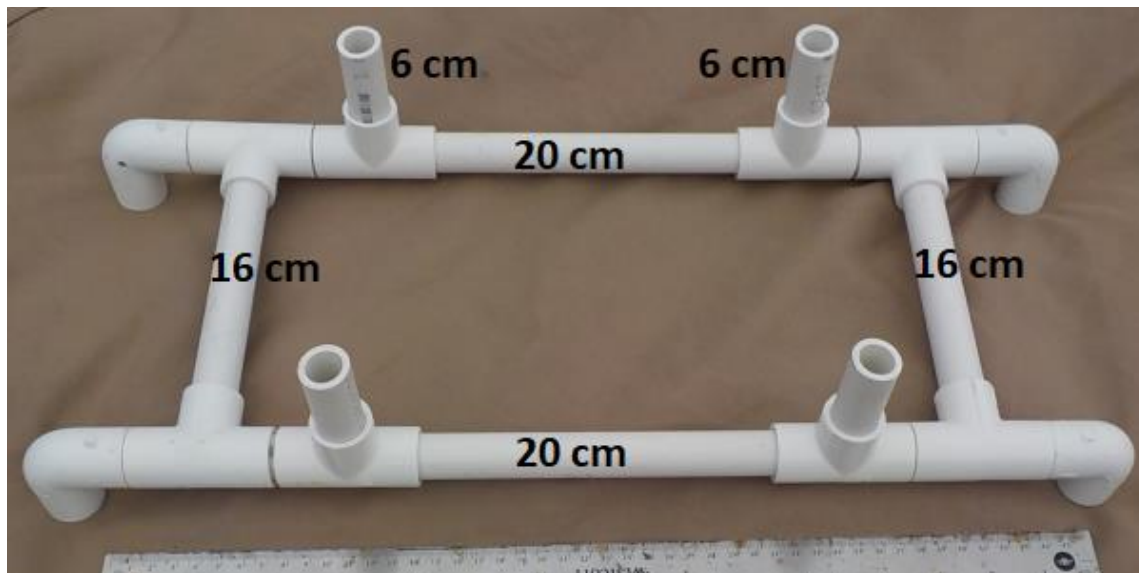


The base of the coral colony is attached to the coral reef.

Coral fragments and nursery



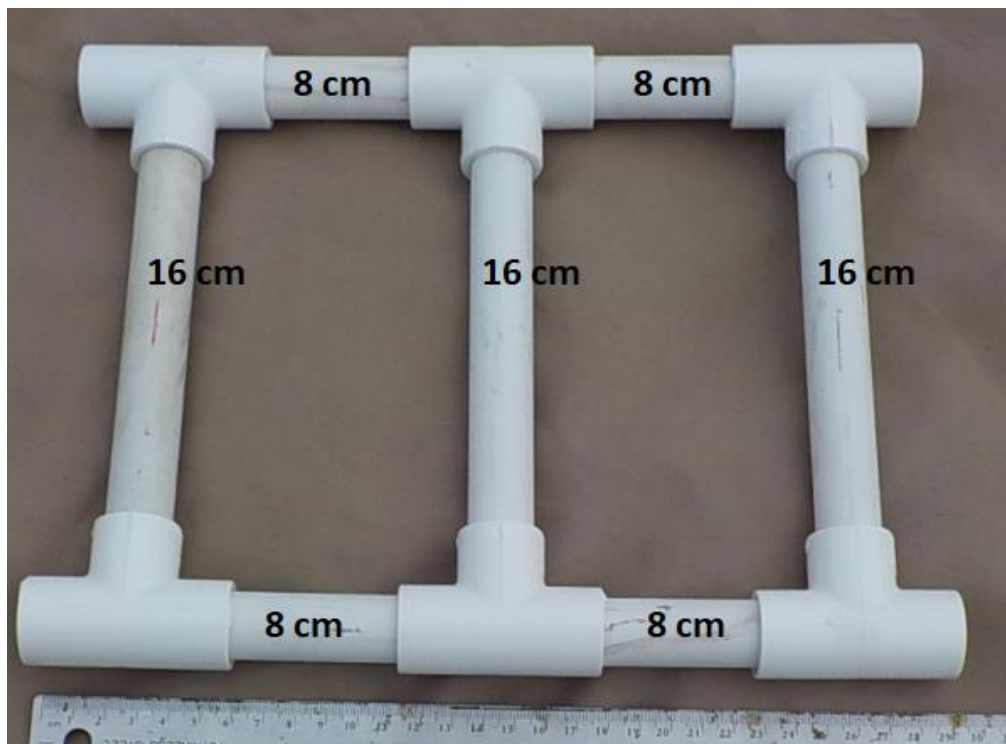
The coral fragments. The head of a [3/8-inch x 3-inch hex bolt](#) is inserted into a 1.5 cm length of 1/2-inch PVC pipe. A hammer should be used to pound the head of the bolt into the pipe. The nursery will have two of the branched fragments (middle photo) and two of the straight fragments (right photo).



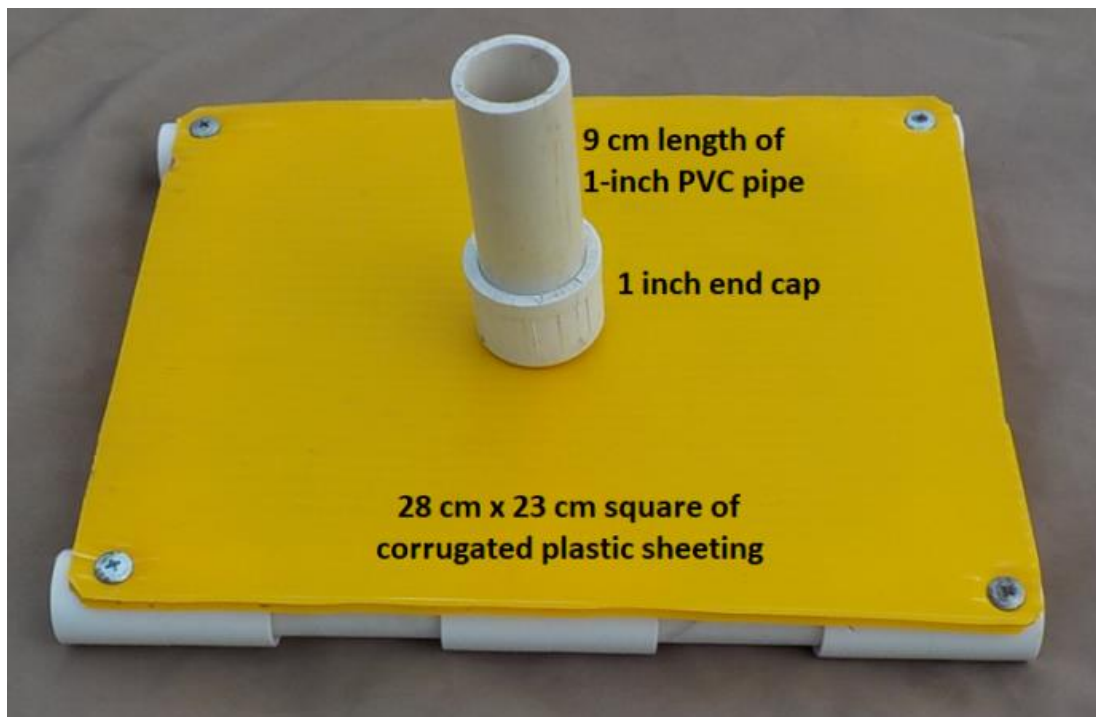
The coral fragment nursery.



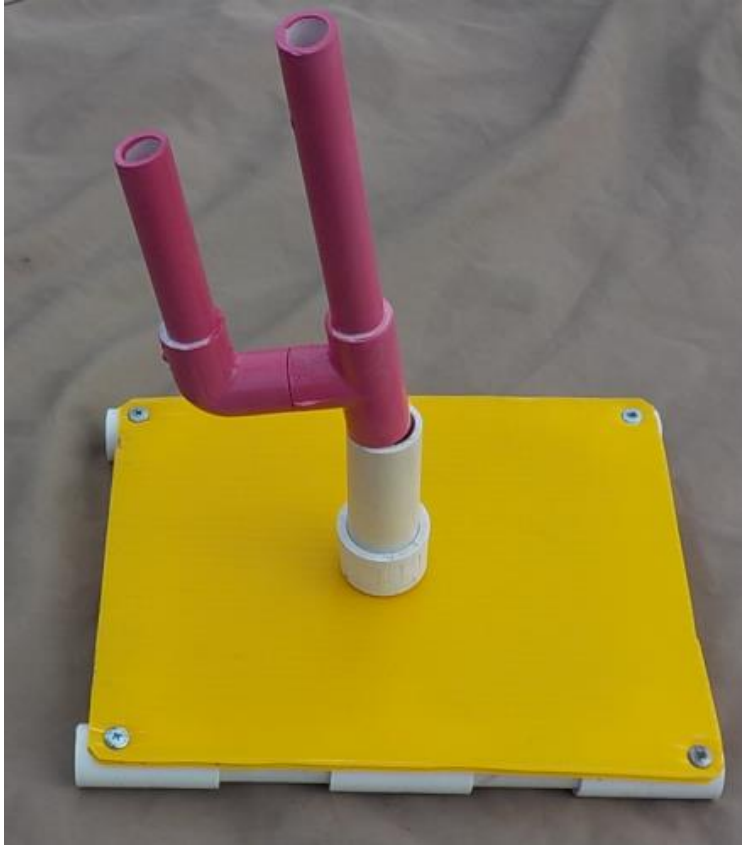
Four coral fragments in the nursery.



The ½-inch framework of the designated area for the coral fragments.



The designated area for the coral fragments. Screws are used to attach the 1-inch end cap to the PVC pipe of the framework.



A coral fragment is outplanted into the designated area.

Crown of Thorns Sea Star

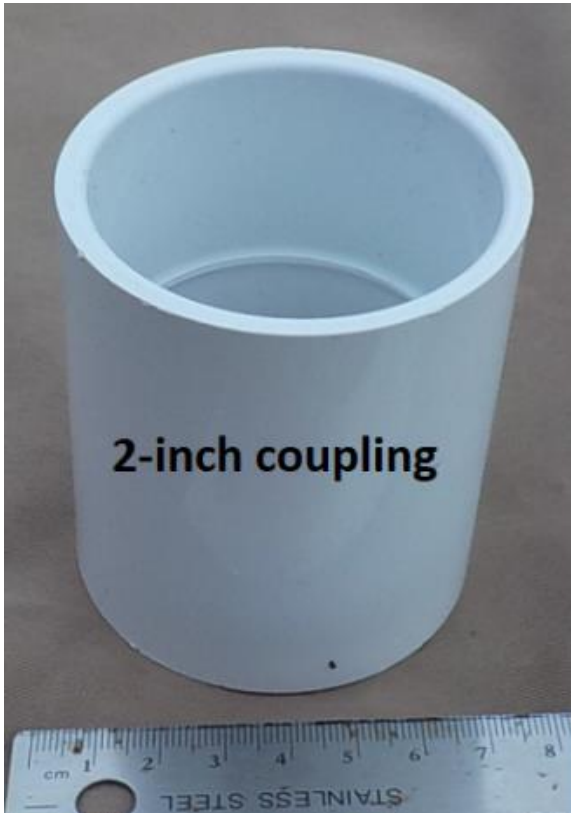


Left: A Crown of Thorns sea star. Note the Velcro loops attached to the sea star. Right: A Crown of Thorns sea star injection device with Velcro hooks.



The injection device is attached to a Crown of Thorns sea star.

The Sponge



Left: A 2-inch coupling. Right: The sponge. Companies must collect the top most coupling.

Task 3: Maintaining Healthy Waterways II: Delaware River and Bay

The Drain Pipe

The drain pipe will be no longer than 3.2 meters and constructed from [6-inch Corex drain pipe](#). The Corex drain pipe will rest on the bottom of the pool and will not curve. The far end of the pipe will be covered. The drain pipe will be weighed down.



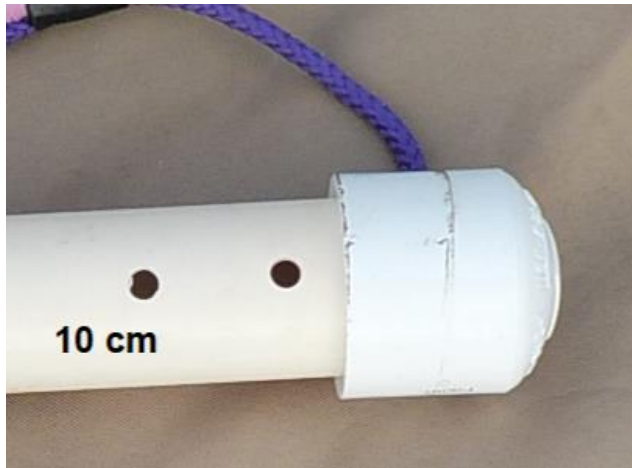
Left: The open end of the 6-inch Corex drain pipe. Right: One end of the 6-inch Corex drain pipe is covered with corrugated plastic sheeting.



The drain pipe.

The Sediment sample:

The sediment sample will be constructed from a 10 cm length of 1-inch PVC pipe with two 1-inch end caps attached to each end. ¼-inch holes will be drilled in the end caps to allow water into the pipe. A 32-cm length of rope will act as a grab point for the sediment sample. The 1-inch pipe will be covered with [white industrial strength Velcro loops](#).



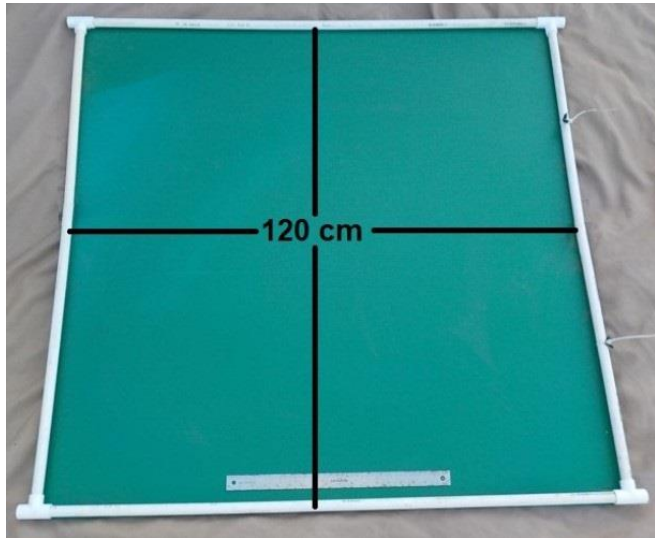
Left: The sediment sample without Velcro loops. Right: The sediment sample with Velcro loops.



The sediment sample is located at far end of drain pipe. Note: This photo is taken at the far end of the pipe (the covering on the far end has been removed).

The Mussel Bed

The mussel bed is constructed from a 124 cm square sheet of corrugated plastic attached to a ½-inch PVC framework.

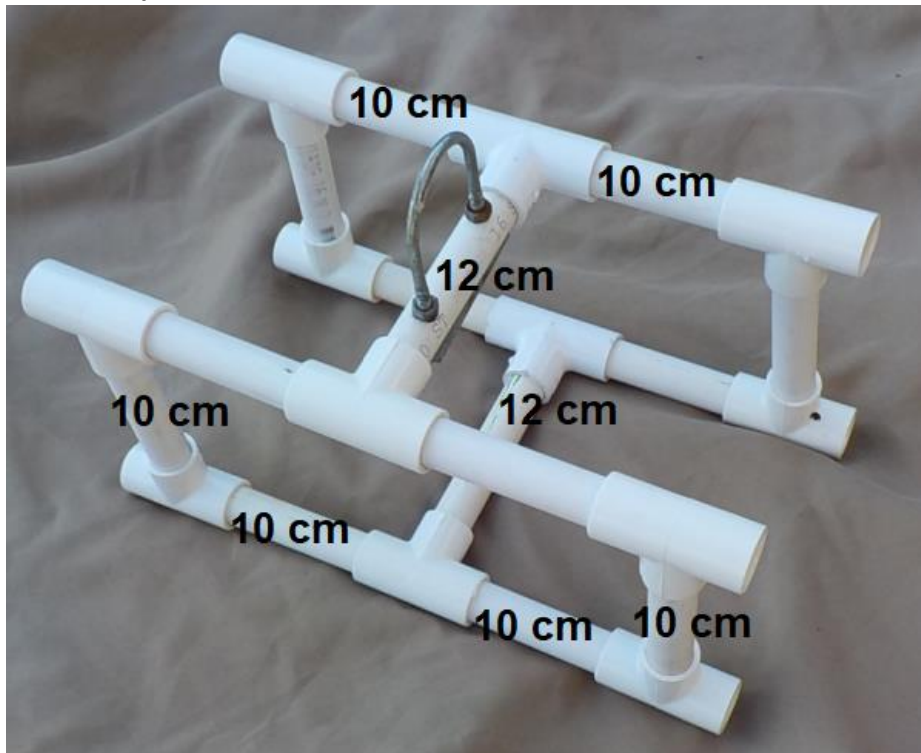


The mussel bed. Note: The color of the corrugated plastic sheeting may be different.



A mussel. Mussels are simulated by [checkers](#) or [plastic chips](#). Mussels are attached to the corrugated plastic with hot glue or epoxy.

The Eel Trap



The ½-inch PVC framework for the eel trap with a [#310 U-bolt](#) grab point.



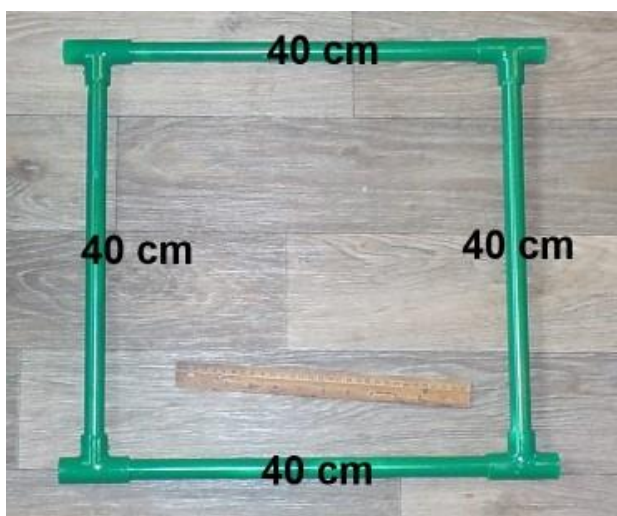
A completed eel trap. 1-inch [plastic mesh](#) covers the PVC framework.



An eel. 1-inch PVC pipe.



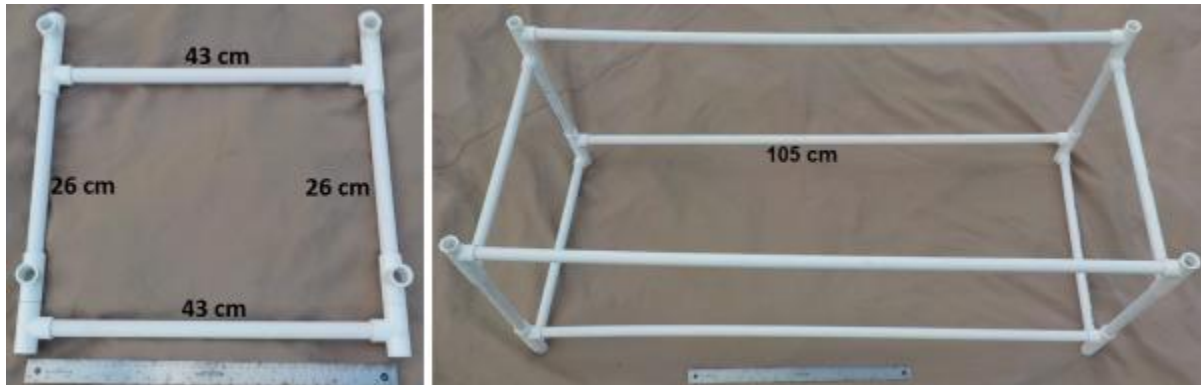
Two eels in the eel trap.



The eel trap designated area.

The Subway car

The subway car is constructed from a ½-inch PVC framework covered by corrugated plastic sheeting.



The framework of the subway car.



The subway car. Dimensions may differ by up to 10 cm from those shown here. [Colored duct tape](#) is used mark the edges of the subway car.



A photo of the top of the subway car.



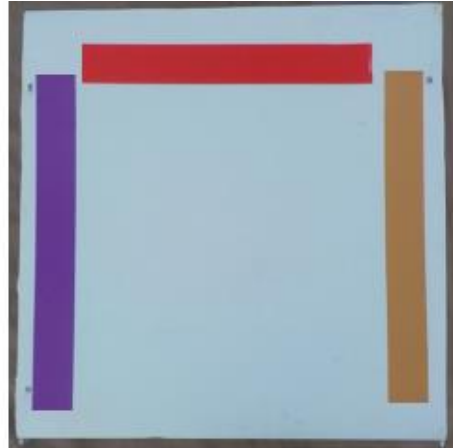
A photo of one side of the subway car.



A photo of one side of the subway car.



A photo of one side of the subway car.



A photo of one side of the subway car.



A photomosaic of the subway car using the five images shown above.

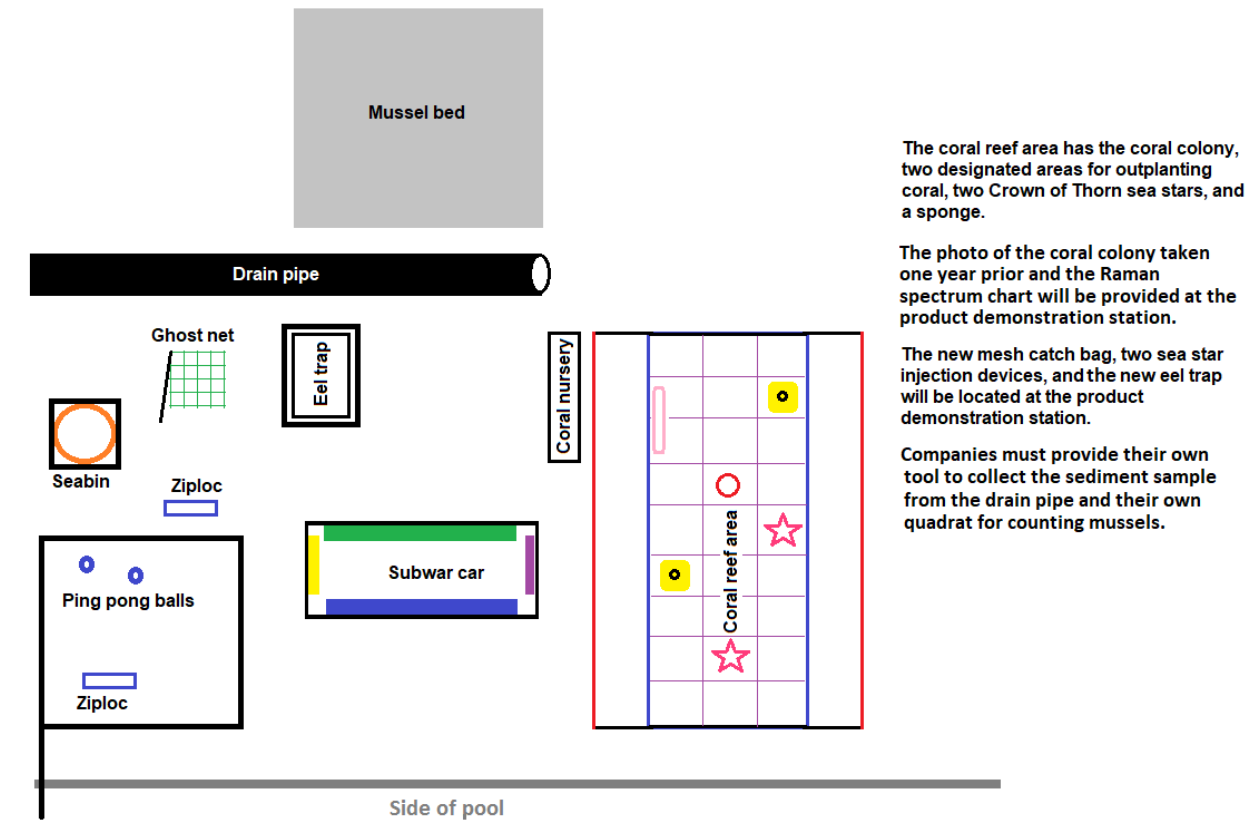
Numerous links have been provided for product demonstration props purchased from Amazon.com. You are welcomed to find other sources, but please consider using [Amazon smile](https://smile.amazon.com/): <https://smile.amazon.com/> and choosing MATE Inspiration for Innovation as your support organization. Every time you purchase an item, for the competition or otherwise, Amazon Smile will donate 1% of the purchase price to MATE Inspiration for Innovation / the MATE ROV Competition. This adds up!

Thank you for your consideration and support!
The MATE ROV Competition



EXPLORER class product demonstration set up:

The following is a potential underwater set up for the EXPLORER class product demonstration.



Update Notes:

Updates are highlighted in yellow.

EXPLORER prop building instructions 12-20-2019.

None