

2.0 The Frame

The frame of an ROV has two purposes, structure and protection (Figure 2.1). The frame holds all of the thrusters that give it mobility, the tools that the ROV might employ to complete a mission, and a point to fasten the wire connections that bring the information from the surface to the ROV. ROVs are built for underwater exploration. During these operations the ROV might encounter tight spaces. If the motors or mission tools are installed on the outside of the frame it makes them vulnerable. If the “working” parts are connected inside the frame, then the frame takes the brunt of any force an ROV might experience. An ROV needs to be rugged enough to allow it to continue working after bouncing off of the side and bottom of the pool. It is best to consider building the frame so that the outside edges of the propeller blades are inside the frame.

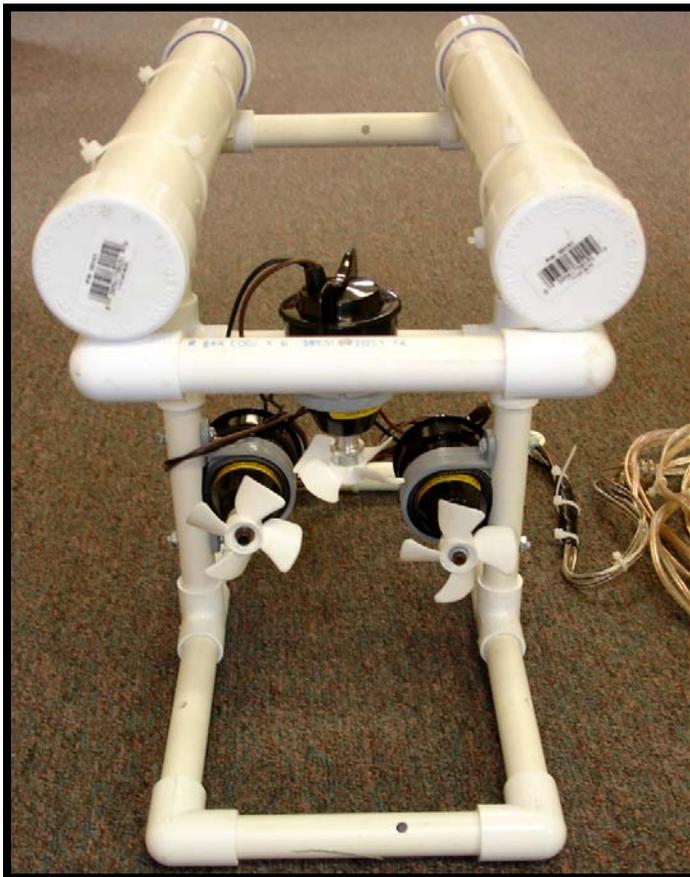


Figure 2.1: The ROV Frame Provides Structure and Protection for the Propellers

Frame Construction

The frame is built using pieces of ½" Schedule 40 PVC pipe (Figure 2.2). A 10' section of this material can be purchased at a local home building store (Lowe's, Home Depot, True Value Hardware) and costs \$1.79. The straight PVC section is cut into 6" lengths, so each section provides 20 pieces for ROV construction. Each section has a 3/8" hole drilled through it. This hole allows the ROV frame to fill with water when it is placed in the pool. The water within the frame reduces the ROV's working weight in water and minimizes the amount of energy that is needed to move it. In addition to the 6" pieces, 3" pieces are also cut. The short pieces are sometimes used to extend the frame.

The 90 degree elbows (Figure 2.3) and "T's" (Figure 2.4) cost about 20 cents apiece. Four elbows are needed to square a frame and the "T's" are required to connect multiple levels of frames. The minimum number of pieces it takes to create a working ROV frame is 4 elbows, 4 – 6" frame pieces, and one float. A "4-way" connector is molded by PVC-Fittings.com (Figure 5) that is handy when it comes to integrating the thrusters into the ROV frame with the least amount of frame members. All of the fittings are available at www.pvcfittings.com.



Figure 2.2: PVC Pipe Sections 1/2" & 1 1/2" 10' Lengths



Figure 2.3: 90" elbow for frame ends



Figure 2.4: T to install thrusters



Figure 2.5: 4-way PVC ½" allows efficient installation of the thrusters into the ROV frame.

(available at <http://www.pvcfittings.com/>)

Building the Buoyancy pontoons

Note that the top of the ROV has two pontoons that give the ROV a slight amount of buoyancy (Figure 2.1). We want the ROV to be slightly positively buoyant so that when power to the unit is cutoff it will float (slowly) to the surface.

We'll need 2 (two) 15" cylinders of 1.5" PVC and 4 end caps (Figure 2.6) for this construction and 4 end caps (2 for each pontoon) (Figure 2.7). Use a plastics type of glue to secure the end caps to the 15" PVC cylinders. These two pontoons will be fastened to the top of the ROV you've built.

Use at least two 14" Plastic Cable Ties to secure each pontoon to either side of the top of the ROV (as pictured in Figure 2.8).



Figure 2.6: End Caps to seal the 15" Pontoons.



Figure 2.7: What you need to construct the pontoons. 1 15" section of 1.5" PVC, 2 end caps, and some stinky plastic cement.



Figure 2.8 The PVC Pontoons are affixed to the ROV frame using Plastic Cable ties. The pontoons should not "wiggle". They should be firmly attached.