

Obstacle Ground Robot Construction

The obstacle robots have a vertical extension made of THIN WALL PVC PIPE (note, this is NOT schedule 40 pipe, which is too thick and heavy). The height of these pipes (one per obstacle robot) will vary in height up to two meters. This obstacle height is arbitrary and can vary from run to run and venue to venue. This document describes how the obstacle robot pipes can be attached to the robots so that teams can replicate their own obstacle robots for testing at their institutions prior to competing in Mission 7 of the International Aerial Robotics Competition.

Essential components, besides the iRobot Create and its controller hardware, are a length of thin wall PVC pipe, a “Drain Cleanout Plug”, a “Drain Cleanout Adapter”, glue, screws, and the same surface plate used to hold the Hall-effect magnetic sensor used in the target ground robots.

All components can be purchased either online or at local building supply stores such as The Home Depot, Lowe's, or Ace Hardware. The PVC parts shown here come from Normandy Products Company (<https://www.normandyproducts.com/PVC.html>).

The basic design involves removing the nub on the cleanout plug, inverting it and attaching it to the surface plate with glue and screws. The female cleanout adapter is then threaded onto the inverted plug and a section of thin wall PVC pipe is inserted into the cleanout adapter.

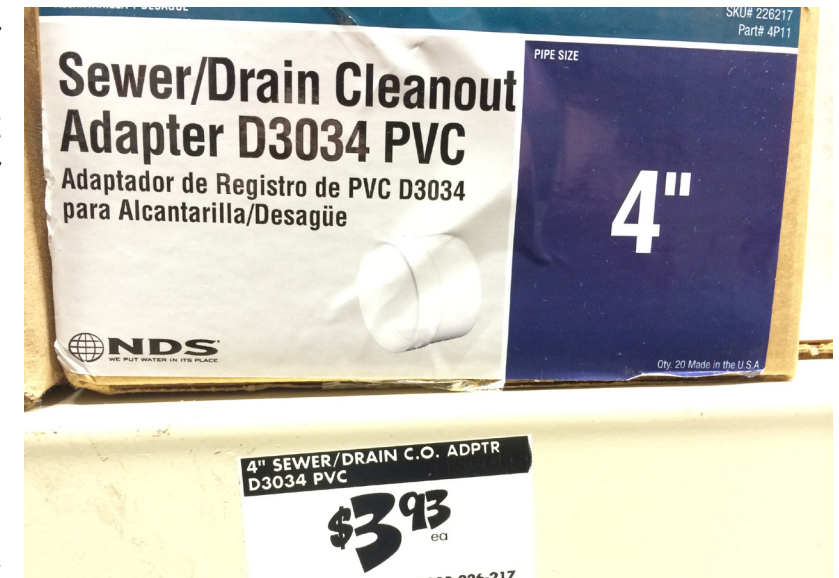


Figure 1. 4-inch PVC Drain Cleanout Adapter, Type D3034



Figure 4. 4-inch PVC Drain Cleanout Adapter, Type D3034

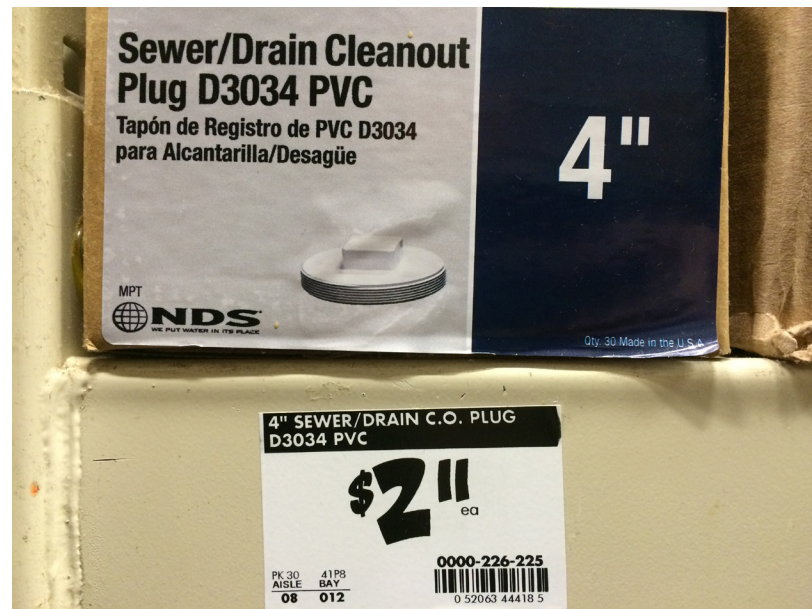


Figure 2. 4-inch PVC Drain Cleanout Plug, Type D3034 - 41P8



Figure 3. 4-inch PVC Drain Cleanout Plug, Type D3034 - 41P8

Construction Method

Begin by cutting the “wrench nub” off of the PVC drain cleanout plug. Cut off any plastic burrs and smooth the flat surface on the plug. The nub can be discarded.

Next, drill 6-32 clearance holes (Drill with #25 bit (0.1495 inch dia)) on each of the four sides of the square opening in the plug. Then position the center of the plug over the 1/2 inch “Centering Hole” in the top plate and transfer the hole locations in the plug to the plate. Drill the plate to match the plug’s hole pattern. Apply polyurethane construction adhesive to the “nub side” of the plug and screw the plug into place on the plate.



Figure 5. Remove “nub” from PVC Drain Cleanout Plug.

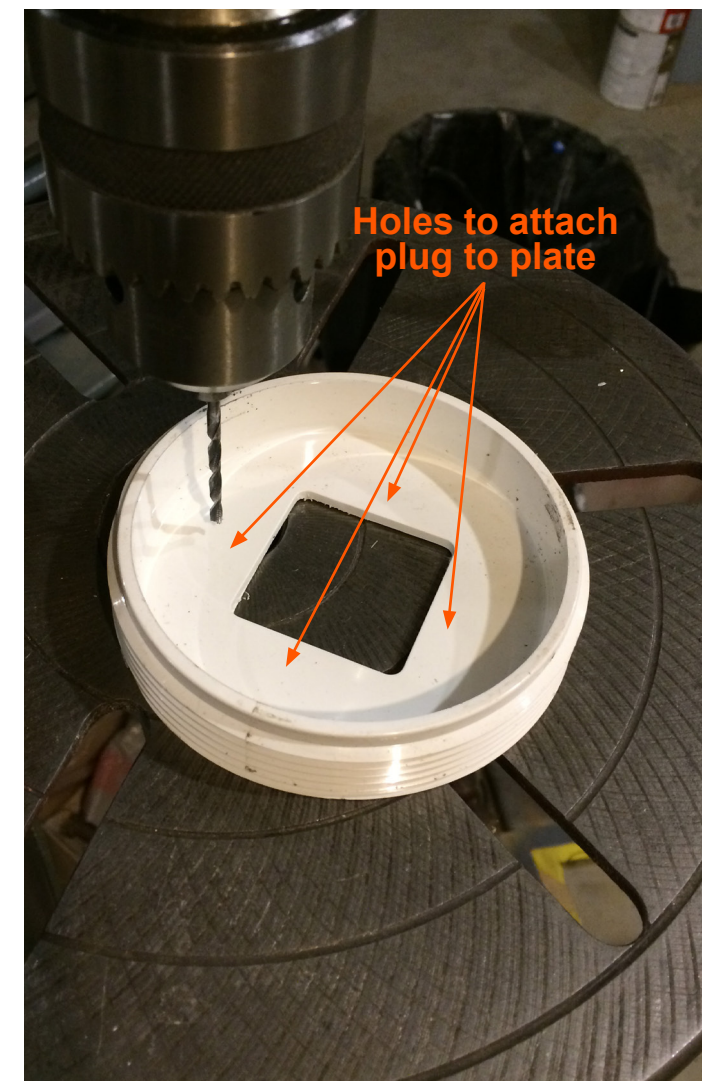


Figure 6. Drill 4 holes (use #25 bit) centered on each side of the square opening.

Transfer the holes in the plug to the plate and drill the plate to match. 6-32 screws are specified, but 8-32 or even 10-32 are options. Once the matching holes have been drilled, apply polyurethane construction adhesive to the “nub side” of the plug and screw the plug into place on the plate as shown in Figures 8 and 9.

Run screws up from the bottom of the plate and through the plug. Secure with nuts. The actual strength comes from the polyurethane adhesive, but the screws assure a tight fit with no slippage during the curing period.

Figure 10 shows the adapter screwed onto the plug. The 4-inch thin wall PVC pipe slides into the adapter. It can be solvent welded, or just pressed in since gravity will hold it in place.



Figure 7. Transfer holes from plug to plate.



Figure 8. Apply polyurethane adhesive and smooth.

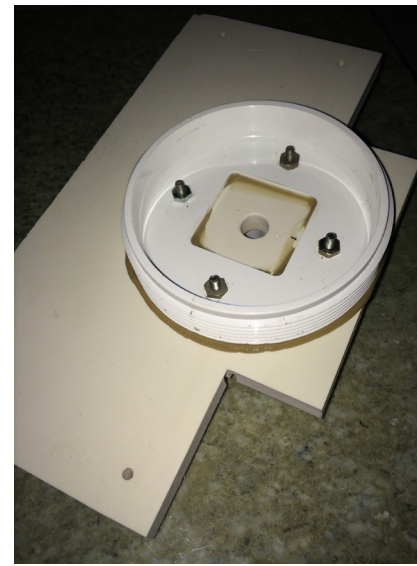


Figure 9. Screw plug to plate from the bottom.

Figure 10. The finished product with the adapter screwed onto the threaded plug. The plate is now ready to be attached to the robot and have its 4-inch diameter thin wall PVC pipe installed.

