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## PVC Pipe Vertical Casting Mold for Pen Blanks

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Although there are several commercially available vertical molds for resin casting pen blanks on the market, using PVC pipe can be an inexpensive way of getting started without buying dedicated silicone molds. Here is how I got started.

### Bill of Materials:

- $\frac{3}{4}$ " Inch Schedule 40 or Schedule 80 PVC Pipe (Schedule 40 ID=0.804", Schedule 80 ID=0.742")
- Optional PVC Pipe Cutter (or saw for cutting the PVC pipe)
- 2" inch length of 1" inch diameter HDPE Plastic Rod (substitute 1" diameter wooden dowel)
- $3\frac{1}{2}$ " by  $3\frac{1}{2}$ " inches  $\frac{3}{4}$ " thick UHMW Polyethylene (substitute standard 1 x 4 x  $\frac{3}{4}$ " pine board)
- $3\frac{1}{2}$ " by  $3\frac{1}{2}$ " inches by  $\frac{1}{16}$ " inch thick Silicone Sheet (Hobby Lobby, Sunny Side Up Silicone Baking Mat)
- $3\frac{1}{2}$ " by  $3\frac{1}{2}$ " inches by  $\frac{1}{16}$ " inch or 2mm thick Closed Cell Craft Foam (Hobby Lobby, Silly Winks Foam Sheets)
- 8" inch long  $\frac{1}{4}$ -20 Threaded Rod,  $\frac{1}{4}$ -20 Nuts, Washers, & Misc.
- $\frac{1}{4}$ -20 nuts and washers (substitute one nut with one Rockler, Easy-to-Grip  $1\frac{1}{2}$ " 4-Star Knob,  $\frac{1}{4}$ -20 threads)
- Hot Melt Glue, Rubber Bands, Permeant Marker & other misc. supplies.
- One 64 oz. Resin Mixing Cup or equivalent that will fit inside your pressure pot
- 8" inches of  $\frac{3}{4}$ " wooden dowel (may need to be turned down slightly to fit through Schedule 80 PVC pipes)



**Figure 1. Tools and Materials used to make the Mold Body**

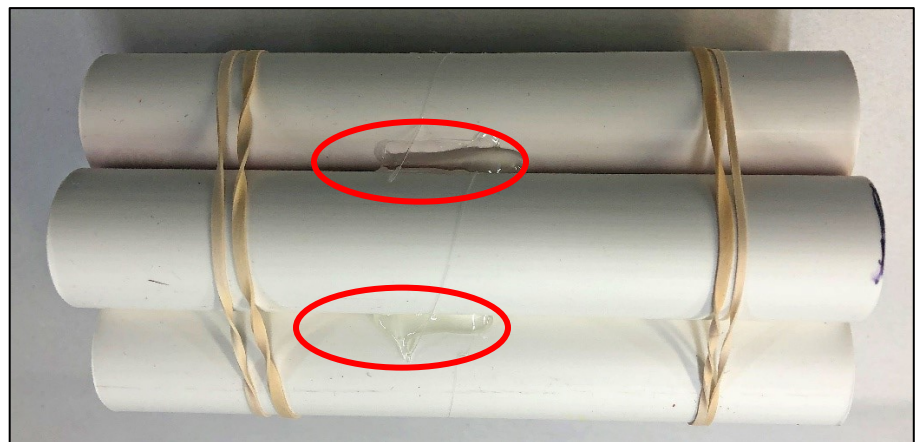
For the **Mold Body**, measure and cut seven pieces of  $\frac{3}{4}$ " inch PVC pipe, each  $5\frac{3}{4}$  long. They can be cut with a saw, but a PVC pipe cutter will provide a square and relatively burr free edge on the pipe.



**Figure 2. Seven pieces of Pipe each 5.75 inches long**



Arrange six of the pieces of pipe into a circle around one central piece of pipe and secure them with rubber bands. Apply a spot or two of hot glue in the middle of the pipes to hold them together as an assembly. (Note: Acetone can be used to remove the marking from most types of PVC pipe).



**Figure 3. Seven pieces of Pipe held together with Rubber Bands and Glued together with Hot Melt Glue**

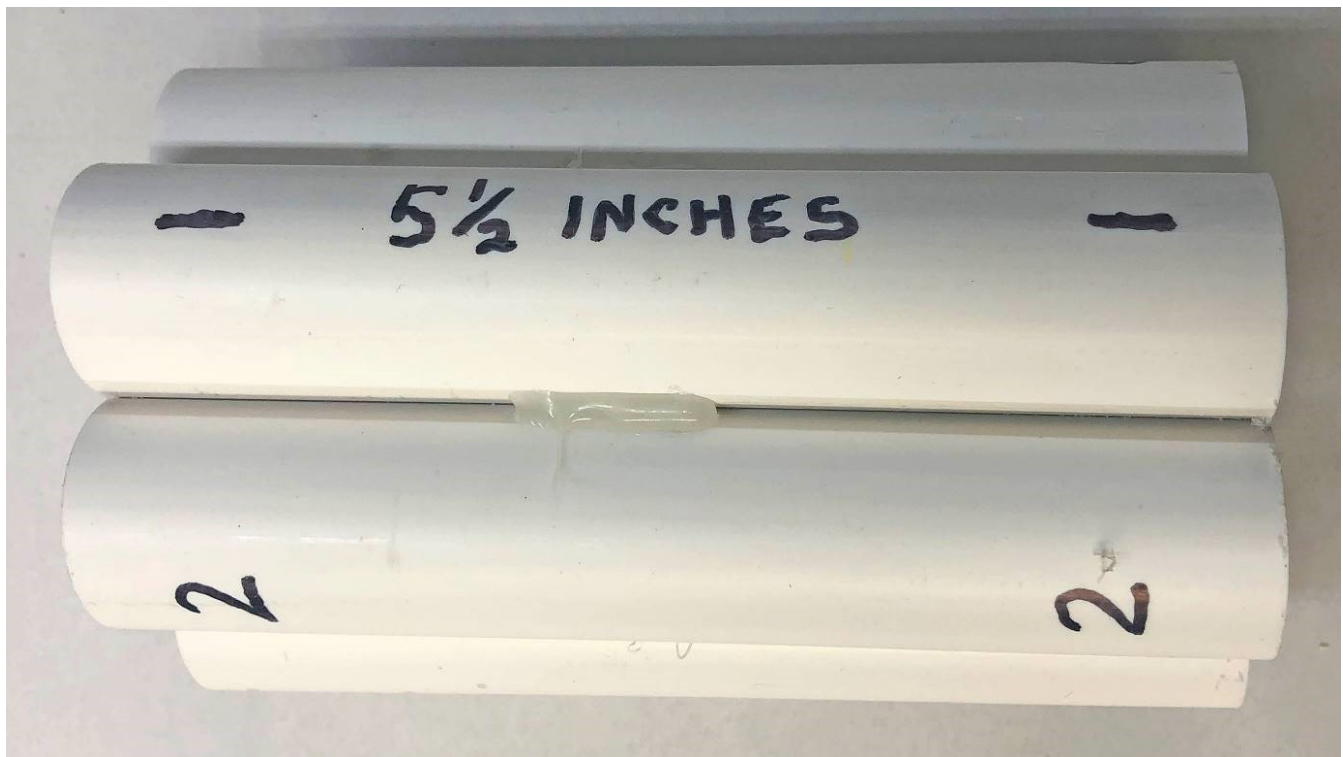


Then pump some hot glue into the gaps between the pipes on the ends to both secure them to the center pipe and to provide a seal on the ends to keep resin from running down the open space between the pieces of pipe. After the glue has hardened, remove the rubber bands and use a miter saw (hand or electric) to shave off about  $\frac{1}{8}$ " inch from both the top and bottom surfaces to make sure they are both flat and perpendicular. This is especially important on the bottom side to insure a good seal between the PVC pipes and the silicone gasket on the **Mold Base**.



**Figure 4. Hot Melt Glue pumped into spaces between the Pipes and the Assembly squared using a Miter Saw**

Use a small piece of sandpaper or other tool to de-burr the ends of the pipes wherever they were left rough from sawing and blow or wash off any bits of plastic debris. For recordkeeping it is recommended that you use a permanent marker to write a mold cavity number on each one of the pipes.



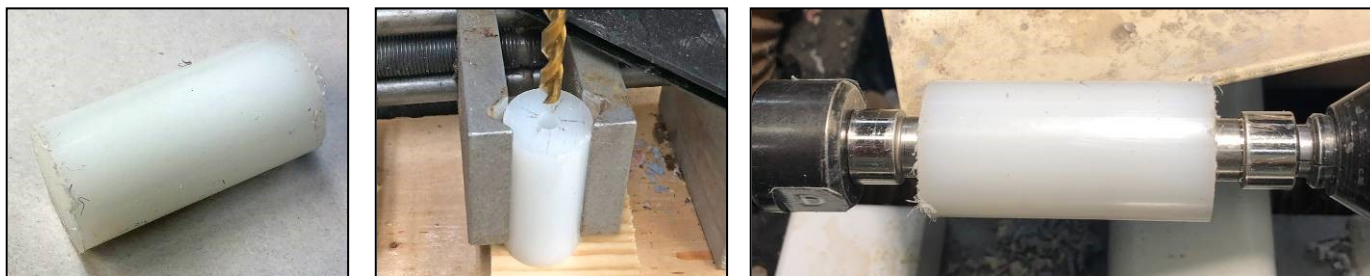
**Figure 5. The completed Mold Body with Length and Cavity Numbers applied**

The mold uses two custom alignment guides. This is only one of many methods that can be used to build them.

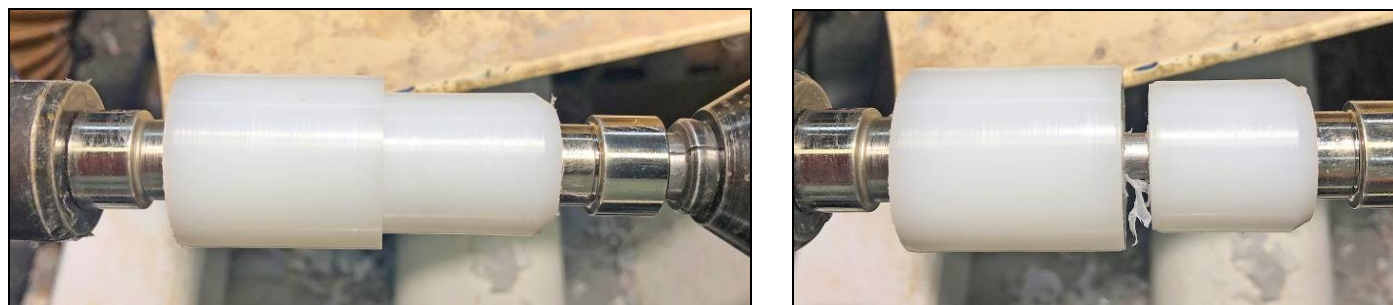
Turn and shape the alignment guides from a 1" inch diameter HDPE Rod that has a ¼" inch hole drilled through it. A standard 1" wooden dowel can be used instead; however, HDPE is a much better choice because most cured resins will stick to wood but they will not stick to HDPE. If wood is used, you should apply wax and mold release to it.

Use a drill press or lathe and a ¼" drill to drill a hole through the center of a 2" inch long by 1" inch diameter rod. Mount the drilled rod on a standard pen mandrel clamping it between two pen bushings (the type and size of the bushings do not matter as they are only for clamping purposes).

**Figure 6. Prepare a piece of 1" diameter HDPE Rod to build the custom alignment guides.**

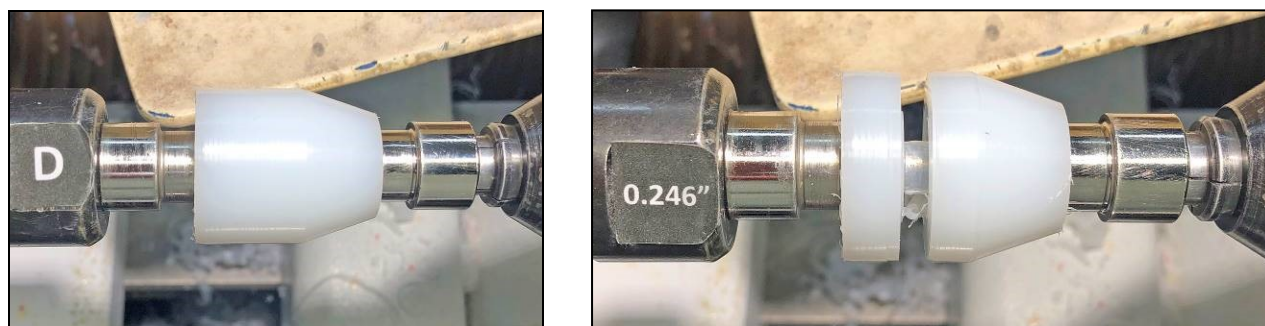


For the **Straight Alignment Guide**, turn about 1" inch on one end of the rod down to about 0.8 inches for Schedule 40 PVC pipe or 0.75" for Schedule 80 pipe. Test the diameter using a piece of PVC pipe to insure that it has a good, but not too-tight, fit. Finish by chamfering the outer edge slightly and by parting the piece off (down to the mandrel). This will be used as a tall washer to hold the ¼-20 threaded rod into the **Mold Base** and it will also act as a centering device on the **Mold Base** for the **Mold Body** when it is installed. The size and purpose of this alignment guide is better illustrated in the following pictures.



**Figure 7. The Straight Alignment Guide turned to fit the ID of the PVC Pipe (0.8" inches) and Parted Off**

For the **Tapered Alignment Guide**, turn a large chamfer or taper in about 1" inch of the remaining rod making it into a cone type shape. The narrow end only needs to be less than the inch inside diameter of the PVC pipe so that it will fit down inside the pipe. The wide end of the piece should remain large (as near to the 1" starting diameter and as much larger than the smaller end as possible). Part it off if necessary to provide an appropriate length (about ¾" inches). This will be used to help center and clamp the **Mold Body** down onto the **Mold Base**.



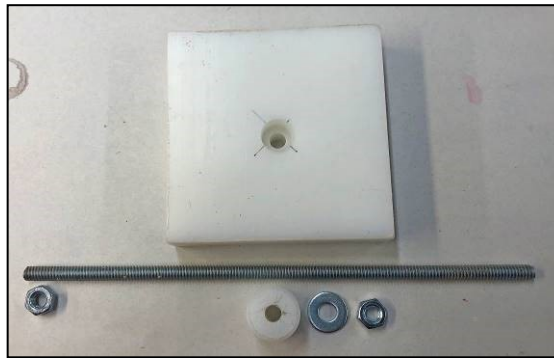
**Figure 8. The Tapered Alignment Guide turned and Parted Off**



The **Mold Base** is a spindle type assembly. First, find the center of a 3½" by 3½" inch piece of ¾" thick piece of HDPE Plastic and drill a ¼" inch hole through it. On one side (the bottom) make a counterbore hole large enough and deep enough to accommodate a ¼-20 nut (½" diameter and ¼" deep should do). A standard 1x4 piece of pine board can

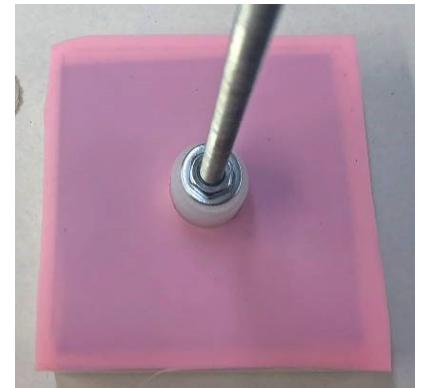
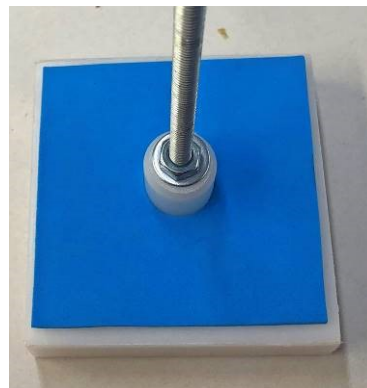
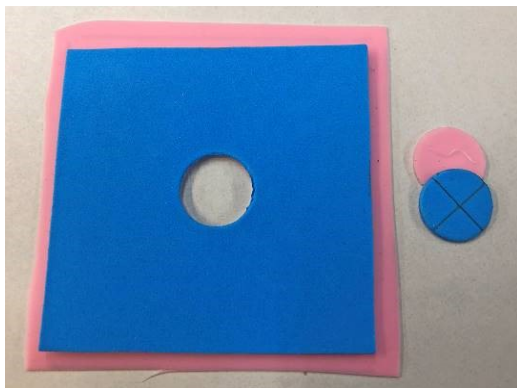
be used instead of the HDPE; however, HDPE is a much better choice because most cured resins will stick to wood but they will not stick to the HDPE. If you use wood, try waxing it heavily and spraying it with mold release to try to prevent resin from sticking to it. *(Although it is not shown in the pictures, I sanded the corners to round them slightly to make the Mold Base fit into the 64 oz. mixing cup a little better).*

Using a piece of ¼-20 threaded rod cut and filed to the desired length, washers, and nuts, attach the threaded rod and the **Straight Alignment Guide** to the **Mold Base** to form a free standing spindle.



**Figure 9. Assemble the Mold Base by attaching the Threaded Rod and 0.8" Straight Alignment Guide.**

Make a **Sealing Gasket** by punching ¾" inch holes in the center of 3½" by 3½" inch pieces of silicone sheet (pink) and closed cell foam (blue), just large enough to fit over the **Straight Alignment Guide**. These sheets will form a **Sealing Gasket** that provides a compressible seal between the **Mold Base** and the **Mold Body** when they are assembled and clamped together. The resin will not stick to the silicone sheet so it is placed on top. Resin will however, stick to the sheet of craft foam. If you cut the craft foam slightly smaller than the silicone sheet it should help protect the edges from getting stuck to resin when it overflows, but at some point in time you will probably need to replace the foam.



**Figure 10. Install the Silicone Sealing Gasket materials on the Mold Base**

When preparing the mold for use, spray mold release (Stoner E302 Rocket Release or other mold release agent appropriate for the resin you will be using) into the PVC pipes that make up the **Mold Body**. (At least for the initial use, be liberal with the amount of mold release). Hold the **Mold Body** above a 64 oz. Resin Mixing Cup to help contain the mold release overspray.

Center the **Mold Body** onto the **Mold Base** by placing the center pipe down over the **Straight Alignment Guide**. Clamp the **Mold Body** to the **Mold Base** using the **Tapered Alignment Guide** with a ¼-20 washer and nut. Use a wrench to tighten it enough to insure that there is a good seal between the bottom of the **Mold Body** and the silicone gasket.

*(I used a ¼-20 lobed jig knob instead of a nut to make the assembly and disassembly of the **Mold Body** to the **Mold Base** significantly easier – with no wrench required. I also used a spare/old pen bushing between the **Tapered Alignment Guide** instead of a washer which raises the knob a little higher and IMO makes pouring easier).*

In order to contain resin overflow and spillage, place the assembled Mold into the 64 oz. mixing cup. This will contain the resin overflow and spillage and will make handling the poured mold easier and it keeps any drips or resin spills from messing up the bottom of the pressure pot.



**Figure 11. The Completed and Assembled Mold ready for use**

The piece of ¾" inch wooden dowel that can be seen in the pictures is used to help remove any stubborn blanks that are stuck in the mold. It is also handy for removing the Tapered Alignment Guide when it gets stuck in the middle pipe (because of the clamping pressure used to seal the pipes against the gaskets). *Note: I had to turn the ¾" inch dowel down slightly and sand it to make it fit through the Schedule 80 PVC pipe.*

For longer blanks to support kit-less, Schedule 80 PVC pipe is preferred over Schedule 40. Schedule 80 has an actual ID of about 7.42 inches which will fit in a standard ¾" inch ER32 Collet Chuck where Schedule 40 would require an oversized 1<sup>3</sup>/<sub>16</sub>" or 7<sup>8</sup>/<sub>8</sub>" inch collet. The other benefit is that Schedule 80 uses about 17% less resin by volume. Also to support **Mold Bodies** made from longer lengths of pipe, for 8½" or 9" blanks, a short piece of ¼-20 threaded rod and a coupling nut can be used to extend the threaded rod. The limiting factor is the working depth of your pressure pot.

*Even if the outside six pipes are made from Schedule 80 PVC, I always make the center pipe from Schedule 40. That way it will always fit snugly over the **Straight Alignment Guide** on the **Mold Base**. This makes the base more universal.*

