



## Preparation and Welding of High Density Polyethylene (HDPE)

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### For farming and personal projects

HDPE is a common plastic that can be heat welded in the field using specialized equipment. Fish farmers may find this material useful when used for building hauling tanks, fish tanks, or other farming related uses. As a plastic, HDPE material is lighter than metal, non-corrosive, long lasting, and is a poor conductor of electrical current. High density polyethylene (HDPE) is a hard plastic that is used in many applications due to its' resistance to degradation and fatigue. Some of the commercial products made from this material include drainage culverts, pipes, and whitewater kayaks. There are specialty companies that can custom make just about any product needed, however the average person can quickly learn how to properly prepare and weld this material.

This publication will present all of the necessary information for constructing relatively simple structures from a customized design that can be made on-site in an economical manner. With the exception of the welding gun, which can be rented from a supply or rental company (Lee Supply Co. Inc. in PA and W.VA. 1-800-353-3747) most of the tools needed are commonly found in a typical garage.

### Tools of the trade

The supply stock for HDPE is available in 4 foot by 8 foot sheets, much like plywood. It can be cut with a circular or jig saw, and it comes in a variety of thicknesses with the thinner sheets being more flexible than the thicker sheets. Black and white are the common available colors for the plastic.



### Workshop tools needed:

circular hand saw  
measuring tape  
permanent marker  
90° square  
electric grinder  
electric drill with bits  
HDPE welding gun (rental)  
3/16" weld spline (not shown)  
level  
safety glasses

### **Site preparation**

There are a few critical steps that must be taken if a strong weld is required. An electric grinder is used to scuff-up both surfaces that will be joined together. This step is easily accomplished by pre-marking the areas to be welded, grinding away the marked spot, and remarking the area. It is worth mentioning the importance of making the correct measurements. Once the weld is made it is very difficult to break the weld because it has literally been melted into a single piece.

Another important preparatory step is the preheating of the two surfaces. The gun blows hot air directly in front of the area to be welded in order to preheat the two surfaces. By holding the gun at a 45 degree angle both horizontally and tangentially (below photo right) to the welded area, the operator will insure an even preheat phase.



**Preparatory grinding of surface**



**45 degree angle for preheating**

The spline is a narrow bead of HDPE that provides the material for the weld. It looks like a thick unending string of spaghetti. Keeping the spline clean and dry is another step to making the best possible weld. The spline comes in a ten pound spool that is wrapped to keep it clean and dry. By allowing the spool to rotate (below photo, on left) as the spline is being used, it can be kept relatively dry and free of dirt. The spline is hand fed into the top of the gun just before the welding begins. When the weld is finished the operator grabs the spline and pulls it away from the gun until it breaks away from the weld. When the next weld begins the end of the spline is fed into the top of the gun once more.



Depending on the unit being built and the strength of the required weld, there are two types of welding guns that are commonly used for joining HDPE together. The smaller of the two guns is the Tack gun, seen in the first photo just under the circular saw. The power requirement for a Tack gun is 110V (single phase). A 6000 watt generator will easily power this tool if used in remote locations.

The larger extrusion welding gun (below photo) has a power requirement of 8000 watts, 230 volt single phase. Both of the guns use a 3/16" welding spline that is sold in ten pound rolls for about \$80. In the photo below the

extrusion welding gun was being used to join a ½” thick HDPE strip to a fish tank made of HDPE material. It is used when a stronger weld is needed and it leaves a wider bond between the two pieces.



Both of the guns have a temperature dial that allows the user to adjust the operating temperature up or down. After a few test welds, the operator will be able to weld at a rate that is fast enough to avoid having the spline gum-up due to overheating. Under normal conditions the gun will allow a welding speed of approximately one inch every 2 seconds. The spline will self-feed into the gun as the operator moves along the weld. A quality control can be done by inspecting a recent weld to look for the

melted plastic between the two pieces that were to be joined together. The tack gun should leave the spline somewhat compressed and not with a cross sectional shape of a circle. If the shape of the spline is unchanged as it emerges from the tip of the tack gun the temperature needs to be increased or the operator needs to move slower.

Be sure to give the welded area a few minutes to cool down before touching the plastic. Welding can also be used to repair or patch a damaged piece of plastic. For the strongest welds it is recommended that HDPE is welded onto HDPE. If polypropylene or PVC is used the weld may not work well at all.