

HDPE BUTT FUSION PROCEDURES

BUTT FUSION

Butt Fusion is used to make pipe end to end joints. Butt Fusion joining of polyethylene pipe requires that the mating surfaces are square to each other and properly prepared. The surfaces are simultaneously heated and melted with a hot-plate heater. The hot plate heater is then removed and the melted surfaces are pressed together and held under pressure. As the molten surfaces are pressed together, the melted ends mix and once cooled, they fuse into a permanent monolithic joint which is as strong or stronger than the pipe itself in both tensile and pressure properties.

BUTT FUSION PROCEDURES

Procedures for joining polyethylene pipe described here are in alignment with PPI (Plastic Pipe Institute) TR 33 Generic Butt Fusion Joining Procedures.

SET UP

Heating tool surfaces must be at a specified temperature of a MINIMUM 400 DEGREES F – MAXIMUM 450 DEGREES F. All points on the heating plate must be within the specified temperatures before you begin. Heater plates should be checked periodically with a pyrometer in all points where the heating plate comes in contact with the pipe. Heater plate's surfaces should be clean and undamaged.

Interface pressure should be set at a MINIMUM 60 PSI – MAXIMUM 90 PSI. Interface pressures are calculated for manual fusion machines equipped with a torque wrench and hydraulic machines pressure gauge settings. *The machine manufactures instructions are used to calculate the interfacial pressure.* Each pipe size and sdr should be calculated and set before beginning to join that size of polyethylene pipe.

PROCEDURE

SECURE PIPE

Clean the inside and outside of the pipe or fitting with a clean, dry, lint-free, non-synthetic (cotton) cloth or paper towel. Align the pipe or fitting ends in the machine. Adjustable pipe rollers or outriggers are used to level the pipe into the fusion machine clamps without forcing the pipe into alignment against open fusion machine clamps. Pipe and fittings ends should protrude past the line-up clamps so that facing will be complete. Check to see that clamps are properly secured to prevent pipe and fitting slippage.

FACE

Insert the facing tool between the pipe ends and trim them until they are complete smooth, clean, parallel butt ends. Face completely until fusion machine stops. Check to insure that there are no

nicks or un-faced areas in the pipe ends. Remove all shavings from the pipe ends and inside the pipe after facing. *Do not touch the pipe ends with your hands after facing.* Clean if necessary with a clean cloth or paper towel and alcohol to remove any oil present from touching the pipe ends.

ALIGN

Bring the pipe ends together after facing. Check for slippage at fusion pressure and high low alignment. If necessary, adjust high side by tightening clamps. Do not loosen low side as slippage could occur during fusion. *Do not use fingers to check alignment under hydraulic pressure. Slippage under pressure could result in crushed fingers.* Look for complete contact around both ends with no gaps and no misaligned hi - low areas.

MELT

Check that the heating tool is maintaining the correct temperature. Insert the heating tool between the pipe ends and bring the pipe ends together under pressure to ensure full contact against the heating tool. Hold the pipe/fitting ends against the heating tool without pressure. A "roll back" or bead of melted polyethylene will form on the pipe ends against the heating tool. When the correct rollback bead size is formed, separate the pipe ends and remove the heating tool.

PIPE SIZE	MELT ROLLBACK BEAD SIZE
2" TO 4"	1/8" TO 3/16"
4" TO 12"	3/4" correct joining pressure TO 1/4"
12" TO 24"	1/4" TO 7/16"
24" TO 63"	7/16" TO 9/16"

JOIN

Immediately after heater plate removal, visually check the pipe ends quickly to verify complete heating and quickly bring together the pipe ends applying the correct joining force (60-90 psi interfacial pressure). The correct joining pressure will form a double bead that is rolled back to the pipe surface on both sides of the joint.

HOLD UNTIL COOL

Hold the joining force against the joint until the joint is cool to the touch. A rule of thumb is to cool for 30 to 90 seconds per inch of pipe diameter. This will vary depending on the ambient temperature and the sdr of the pipe. Thicker wall pipe generally requires additional cooling time.

INSPECT THE JOINT

The double bead should be rolled over to the pipe surface on both sides and be uniform in size completely around the pipe. When butt-fusing pipe to molded fittings, the bead may have an irregular appearance. This is acceptable providing the pipe side bead is acceptable.

4-inch pipe	1600 feet
12-inch pipe	960 feet
24-inch pipe	480 feet

BEAD APPEARANCE

It is uncommon to remove internal beads as they have little or no effect on flow and removal is time consuming. Exterior beads may be removed with a planner, which is forced into the bead and then drawn around the pipe.

BEAD REMOVAL

Excessive bead width.	May be caused by overheating or excessive fusion pressure.
Bead V-groove too deep.	May be caused by excessive fusion pressure-insufficient heating or pressure during the heating cycle.
Flat bead on top.	May be caused by overheating or excessive fusion pressure.
Bead is not uniform around pipe.	May be caused by incomplete facing, misalignment, or defective or worn equipment.
Bead is too small.	May be caused by insufficient heating or fusion pressure.
Bead is too large.	May be caused by excessive heating time.
Bead not rolled over to pipe surface.	May be caused by insufficient heating.
Squared outer bead edge.	May be caused by pressure during the heat cycle.
Rough, pockmarked, or Sandpaper like bead.	May be caused by hydrocarbon contamination.

The most common mistakes making butt fusion joints are:

1. Applying pressure during the heat soak period. This squeezes the molten plastic out of the fusion joint, possibly resulting in a cold joint.
2. Incorrect fusion pressure. An interface pressure of 60 to 90 psi is required to make a correct fusion joint.
3. Incorrect heating temperature. Some operators try to hurry the heating time by increasing the heater temperature. This may cause the molten PE to degrade resulting in fusion joint failure. When fusing in cold weather the time to obtain the proper melt may increase. **DO NOT INCREASE THE HEATING TOOL TEMPERATURE. THE MELT BEAD SIZE DETERMINES THE HEATING TIME.**



McElroy Manufacturing, Inc.
The leader by design.
Tulsa, Oklahoma U.S.A.

DRAWN: SWB
CHECK: BWP
APPRVD: B
DATE: 5/16/95
SHI No: 1
REV No: Y
PART No: 200101

2" COMBINATION FUSION MACHINE ASSEMBLY

NOTE: THIS DRAWING AND THE INFORMATION CONTAINED THEREIN IS THE CONFIDENTIAL AND PROPRIETARY PROPERTY OF McElroy Manufacturing, Inc. THE DRAWING IS NOT TO BE REPRODUCED IN ANY MANNER, SUBMITTED TO OUTSIDE PARTIES FOR EXAMINATION OR USED DIRECTLY OR INDIRECTLY FOR THE PURPOSES OF OTHER THAN THOSE FOR WHICH IT WAS FURNISHED WITHOUT WRITTEN PERMISSION OF McElroy Manufacturing, Inc.

NOTES:

1. INSTALL WITH ANTI-SEIZE COMPOUND.
2. TORQUE GUIDE ROD NUTS TO 50ft/lbs @ ASSEMBLY.
3. LOCATE LABEL APPROX. AS SHOWN BOTH SIDES.
4. LUBE W/ GULFWAY #68 W/ FIRST ASSEMBLY. USE 10W30 MOTOR OIL FOR SUBSEQUENT LUBRICATIONS OF GUIDE ROD BUSHINGS.
5. THIS PART USED ON LOT-NO. 75-0434 AND ON.
6. THESE PARTS WILL NOT FIT UNITS W/ A LOWER LOT NO. THAN 72-1030.
7. WHEN ORDERING REPLACEMENT PARTS, SPECIFY LOT NUMBER OF UNIT.
8. ITEMS SHOWN IN PARENTHESIS REFLECT QUANTITIES IN A LOCAL GROUP AND MAY NOT INDICATE TOTAL ASSEMBLY QUANTITIES.

