

# Polyethylene Gas Pipe Manual Butt Fusion Procedure

## Introduction

This document has been developed to assist workers responsible for the butt fusion joining of Teel Plastics piping products in the gas and energy applications. This procedure is in alignment with ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings. Please refer to ASTM F2620 for more specific butt fusion information, guidance, and safety information when using manually powered fusion machines

## Equipment

The equipment needed for manual butt fusion include the proper manually operated butt fusion machine for the pipes being fused (such as the McElroy #2LC, Pit Bull®14 and Pit Bull®26), a facing unit, a heating unit for heating the ends of the pipe, and the proper inserts for the pipe sizes to be butt fused. Pipe support rollers and stands are also needed to bring the pipes, to be fused, in alignment with the fusion machine centerline. A 120VAC power supply is required so a generator is usually required. Consult the fusion machine manufacturer's information on the size generator required.

## Set-Up Guidelines

1. Ensure the fusion equipment used meets the manufacturer's specifications and is in good working order before using.
2. Make sure the fusion machine operator has been trained properly on the manual butt fusion machines being used, typically in accordance with ASTM F3190.
3. Set up the fusion machine in a level area if possible. If operated at ground level, pipe rollers are available for better alignment to the fusion machine centerline and to protect the pipe as it is pulled down the pipeline.
4. If the manually operated fusion machine is equipped with a stand, install a pipe support stand or McElroy PolyPorter®, about half the length of the pipe segment to be installed, on both ends of the fusion machine to help with alignment.
5. Check the print-line on the pipe to be butt fused to make sure it meets the pipe specified for the job.
6. Make sure the proper pipe size inserts are installed in the machine clamps to match the pipe OD to be butt fused.



## Procedure

Note: See ASTM F2620 Section 8 for the complete butt fusion procedure.

After setting up the fusion machine and the pipe supports, plug in the facing unit and the heating unit to the appropriate voltage outlet (usually 120VAC). Set the heating tool's temperature to approximately 440° F and allow time to heat up before proceeding with the fusion process. The heaters surface temperature should be 425° F ± 25° F. This should be confirmed before each fusion with an infrared or surface pyrometer in center area of the heater surface.

## Clean, Install and Clamp

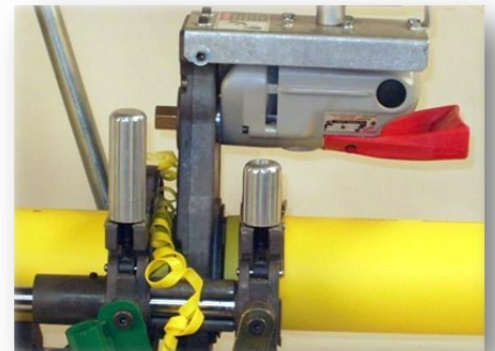
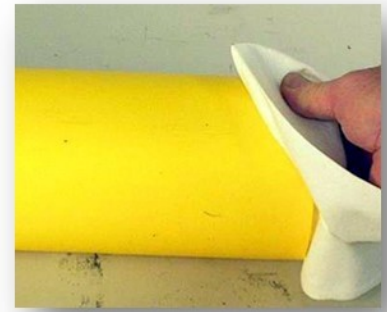
Clean the pipe ends, before placing in the fusion machine, with a clean, dry lint-free cloth like cotton. Set the pipe ends into the fusion machine with the ends protruding inside the jaws about ¾" and clamp the pipes until firm resistance is felt.

## Face

Install the facing unit into the fusion machine between the two pipe ends. Turn on the facing unit and manually move the movable jaw to make the facing unit meet both pipe ends. Keep constant light pressure against the facing unit until the facer body bottoms out on the mechanical stops. Turn the facer off, back off the movable jaw and remove the facer and shavings from the machine. Brush any loose shavings away from the pipe ends with a clean, dry lint-free cloth. **Do not touch the pipe ends with your hand or anything that could contaminate the pipe ends.**

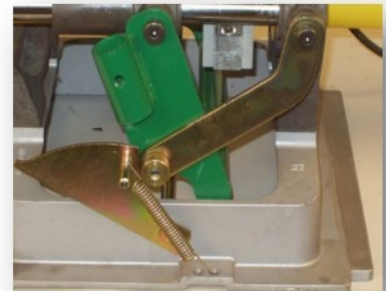
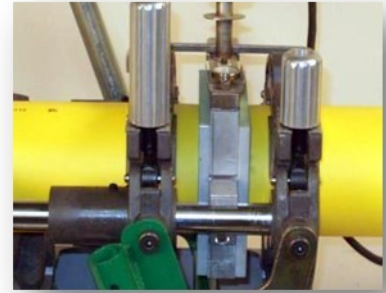
## Align

Bring the pipe ends together and check for any "hi-lo" OD misalignment or gaps. If there is a little misalignment, always tighten the high side down. Then snug both clamp knobs down a little to prevent slippage. There should be no gaps between the pipe ends before heating.



## Heat

Verify the heater surface temperature is 425° F ± 25° F with a pyrometer. Clean the heater faces with a clean, dry lint-free cloth like cotton and install the heater on the guide rods of the fusion machine between the two faced pipe ends. Bring the pipe ends against the heater with light force to ensure full contact. Engage the locking cam if one is available. This is the heat soak cycle and you should not apply any force during this time. Heat the pipe ends until the proper melt bead size is formed between each heater surface and pipe end. (For 2" and 3" IPS pipe sizes, a 1/16" bead on each side of the heater should be attained. For 4" through 8" IPS pipe sizes, a 3/16" bead on each side of the heater should be attained.)



Material Options	Mat.	Heater Surface Temp. (°F)	Melt Bead Size (IN)	Max. Heater Plate Removal Time (SECS)	Min. Cooling Time (MINS)
2" IPS - SDR 11 Yellow	MDPE	425 ± 25	1/16	8	2.38
2" IPS - SDR 11 Black/Yellow Stripe	HDPE	425 ± 25	1/16	8	2.38
4" IPS - SDR 11.5 Yellow	MDPE	425 ± 25	3/16	10	4.3
4" IPS - SDR 11.5 Black/Yellow Stripe	HDPE	425 ± 25	3/16	10	4.3
6" IPS - SDR 11.5 Yellow	MDPE	425 ± 25	3/16	15	6.34
6" IPS - SDR 11.5 Black/Yellow Stripe	HDPE	425 ± 25	3/16	15	6.34

## Remove the heater

After achieving the proper melt bead size, open the movable jaw of the machine until both pipe ends separate from the heater. Remove the heater, inspect the pipe ends for the proper melt pattern (smooth with no marks or contamination). Then bring the pipe ends together and applying just enough force to have the melt beads roll back to the pipe surface. Hold that force for at least 10-15 seconds and if the machine has a locking cam engaged, you can stop applying force and wait for the joint to cool.



## **Fuse/Cool**

Let the fusion joint cool in the machine for a minimum of 11 minutes per inch of wall thickness (i.e. ½” wall pipe will need 5.5 minutes of cool time minimum). If the fusion machine does not have a locking cam, then the fusion force will need to be manually held for the entire cool time.

An additional 30-60 minutes of cooling time is recommended prior to rough handling or backfilling of the pipe depending on pipe wall thickness and ambient temperature.

## **Inspect**

Visually inspect the fusion joint for the proper bead appearance. It must have a complete and uniform double rollback. Check the bead for signs of contamination. Refer to ASTM F2620 for visual acceptance pictures and illustrations.

Pictures provided by McElroy Manufacturing, Inc.

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