

## Butt Fusion Joints

### Fusion Procedure PPI TR-33 and ASTM F2620

#### Iron Temperature: 400°F to 450°F

NOTE: See Standard Practice for Inclement Weather Procedure at 32°F.

- Perform initial cleaning of fusion area to remove dirt and contaminants. Use clean rags or paper towel and/or water. If using soap, remove soap from pipe with water and clean rags, wipe dry prior to using Isopropyl Alcohol Wipes.
- Place pipe ends in fusion machine and face down to stops. (facing pressure should be set as low as possible while still facing pipe, excessive pressure can damage the machine)
- Check high/low alignment, if any adjustment is made, the pipe must be re-faced. After facing, use only new, clean lint free non-synthetic cloth or paper towel to clean faced pipe areas.
- Always wipe heater plate with clean dry, lint free non-synthetic cloth or paper towel.
- Verify that the heater surface temperatures are in a temperature range of 400°F to 450°F.
  - Close the pipe against the heater under fusing pressure.
  - Conduct a bead-up cycle (Manual: Engage cam lock).
  - Shift the selector valve up from fusing to heating position.
  - Watch the pressure gauge until pressure drops to the preset drag pressure or lower.
  - Shift the directional valve into neutral position.
  - Maintain contact of the pipe ends against the heater with no force for the entire heat soak time.
  - Continue heat soak until proper bead size is observed per **Table 2**.
- After heating procedure, verify carriage control valve is in neutral and move selector valve to fusion position.
  - Open carriage, remove heater, quickly inspect melt (melt must be flat and smooth and free of speckled contaminated surface).
  - Butt fuse the pipe, DO NOT slam pipe together.
  - Use pressure from **Table 1** to roll melt bead over to pipe surface and then continue to apply the same pressure for the time specified under fusion cooling time under fusion pressure in **Table 2**.
  - (Manual) With cam lock engaged, continue to apply fusion pressure found in **Table 1** for one minute. Cam lock must remain engaged during fusion (manual).
  - (Hydraulic) Keep required fusion pressure found in **Table 1** on fusion for the minimum cooling time indicated in **Table 2**.
- Allow fusion to cool under fusion pressure for the time listed on **Table 2**.
- Remove fusion from machine.
- Inspect fusion. Ensure double bead width is 2 to 2-½ times bead height and uniform all around pipe.
- Avoid pulling, installation, pressure testing and rough handling for an additional 30 minutes after fusion cooling time as indicated in **Table 2**. For ambient temperature above 100°F, additional cooling time may be required.
- Do not apply internal pressure until the joint and surrounding material have reached ambient air temperature
- Mark all fusions with fuser ID using permanent marker.

**TABLE 1 - BUTT FUSION PRESSURES (ft. lbs. or PSI)**

Size	SDR	1-¼"	2"	3"	4"	6"	8"	10"	12"
McElroy No. 2LC	10 11	5 -	- 10	- -	- -	- -	- -	- -	- -
McElroy No. 14 & 26	10 11 11.5 *13.5	5 -	- 10 -	- -	- 20	- 34	- 72	- -	- -
McElroy 28 LF **TEPA 1.66	11 11.5 *13.5	- -	66 -	- 138	- 228 197	- 495 427	- 838 724	- -	- -
McElroy 28 HF **TEPA 4.71	11 11.5 *13.5	- -	23 -	- 49	- 80 69	- 174 151	- 295 255	- -	- -
McElroy 412 & 618 MF **TEPA 6.01	11.5 *13.5	- -	- -	- -	63 54	137 118	232 200	- 311	- 437
McElroy 412 & 618 HF *TEPA 11.78	11.5 *13.5	- -	- -	- -	32 28	70 60	118 102	- 159	- 223

\*Indicates sleeve pipe only.

\*\*TEPA = Total Effective Piston Area

HF = Green Piston MF = Orange Piston LF = Yellow Piston

SDR = Standard Dimension Ratio (wall thickness)

#### Note:

- The values listed in Table 1 are target values based on an interfacial pressure of approximately 75 PSI. For manual butt fusion machines, this number is calculated with a 15" torque wrench in Foot Pounds (ft. lbs).
- The fusion pressure indicated above does not include drag pressure, insure drag pressure is determined and added to pressure above prior to starting fusion process.
- During heat soak time ensure contact between pipe and heating tool. Heat pressure must be set at drag pressure to maintain pipe contact with iron. If opposing forces are not great enough to move the carriage away from the heater, return the carriage control to the neutral position during heat soak.

**TABLE 2 - BUTT FUSION APPROXIMATE MELT BEAD SIZE AND COOLING TIMES**

IPS Pipe Size (Inches)	Bead Size (Inch)	Fusion Cooling Time Under Fusion Pressure (Minutes)	Rough Handling (Minutes)
1-1/4	1/16	2	30
2	1/16	3	
3	1/16	4	
4	1/8 - 3/16	5	
6	1/8 - 3/16	7	
8	3/16 - 1/4	9	
10	3/16 - 1/4	11	
12	3/16 - 1/4	13	

## Saddle Fusions Using McElroy Sidewinder

### Fusion Procedure PPI TR-41 and ASTM F2620

#### Iron Temperature: 490°F to 510°F

- Wash and wipe dry fusion area to remove contaminants.
- Use new 50 grit emery cloth to remove surface skin from melt areas on pipe and tee.
- Brush away any residue with clean, lint-free, non-synthetic cloth or paper towel.
- Insert tee into machine loosely and seat the fitting on the main with approx. 100 pounds-force, secure the tee in tool.
- Always wipe heater plate with clean dry, lint free non-synthetic cloth or paper towel.
- Verify that the heater surface temperatures are in a temperature range of 490°F to 510°F.
- Place heating tool on main and move the tee against heater.
- Apply bead-up pressure and start heating time, apply initial force until melt is first observed on crown of pipe then reduce pressure to zero for remainder of heat soak time.
- Mark all fusions with fuser ID using permanent marker.

**TABLE 3 - ALL TAPPING TEES**

IPS Pipe Size (Inches)	Heating Time (Seconds)	Bead-up Pressure	Fusion Pressure	Cooling Time, Maintain Fusion Pressure (Minutes)
*1-¼	*25 - 35 Sec Saddle, 15 Sec Max on Pipe	Per Fitting	Per Fitting	**5
2 - 8	25 - 35			**10
3" and larger branch saddle installed on 6" and larger main	***25 - 35			

#### COOL THE ASSEMBLY FOR AN ADDITIONAL 30 MINUTES BEFORE ROUGH HANDLING, BRANCH JOINING OR TAPPING THE MAIN.

\*DO NOT exceed 15 seconds on 1-¼ pipe when fusing tapping tees.

\*\*Never reduce fusion pressure during the cooling time period listed in Table 3. Reducing pressure during the first cooling period may result in blowout during hot tapping.

#### \*\*\*Branching saddle fusion procedure.

Place the heating tool on the main centered beneath the fitting base, and then place the Flexible Heat Shield between the heating tool and the fitting, apply initial heat force until the melt is visible on the main all around the heating tool, remove heat shield, apply initial force and start time, continue heat force until bead is visible around fitting base, reduce heat force to Heat soak force.

Total Heat Time ends:

- When the Total Heating Time expires for a pressurized IPS 1-¼ in. (42 mm) or IPS 2 in. (63 mm) main; or
- When a melt bead of about 1/16 in. is visible all around the fitting base for a IPS 1¼ in. or IPS 2 in. non-pressurized main, or a larger pressurized or non-pressurized main.

## Socket Fusions

Fusion Procedure ASTM F2620

Iron Temperature: 490°F to 510°F

NOTE: See Standard Practice for Cold Weather Procedure at 32°F.

TABLE 4

IPS Pipe Size (Inches)	Heating Time (Seconds)	Cooling Time (Seconds)	Rough Handling (Minutes)
½ CTS	6 - 7	60	5*
¾	8 - 10		
1	10 - 12		
1-1/4	12 - 14		
2	16 - 19		
3	20 - 24		
4	24 - 29		

\*After cold ring removal, allow fusion to cool additional 5 minutes before exposing joint to any type of stress (burial, testing, fusing).

1. Cut pipe squarely.
2. Clean pipe and fitting inside and outside with clean dry lint free non-synthetic cloth (do not touch cleaned pipe with hands).
3. Chamfer outside edge of pipe (all sizes).
4. Fix cold ring to pipe using depth gauge.
5. Clean heater face with clean dry, lint free non-synthetic cloth.
6. Verify that the heater surface temperatures are in a temperature range of 490°F to 510°F.
7. Push socket onto heater face first, (the socket must bottom out completely and be held against the surface of the heater face) then onto pipe.
8. Heat for required time see **Table 4** (heating time begins when cold ring is bottomed out on heater surface and the pipe is fully inserted).
9. At the end of the heating time, simultaneously remove the pipe and fitting straight out from the tool, using a snap action (**DO NOT twist pipe, iron or fitting**).
10. Inspect the melt pattern on the pipe and fitting socket for 100% melt.
11. Immediately (within 3 seconds) insert the pipe straight into the socket of the fitting so the cold ring is flush against the end of the fitting socket, hold or block the joint in place for the **Cooling Time** specified in **Table 4**.
12. Remove cold ring after cooling time and inspect melt pattern for complete impression of cold ring in the melt surface, there shall be no gaps, voids or un-bonded areas.
13. **Mark all fusions with fuser ID using permanent marker.**

## Electrofusion (EF) Joining

PE 2406/2708 and 4710 Fittings

Read, understand, and follow manufacturer's electrofusion processor operating instructions.

1. Perform initial cleaning of fusion area to remove dirt and contaminants. Clean water can be used for initial cleaning of pipe surfaces prior to scraping. Use isopropyl alcohol wipe after scraping.
2. Ensure that the polyethylene pipe is not out-of-round before attempting electrofusion process.
3. Let the processor acclimate to the job site weather conditions for a minimum of 15 min. prior to beginning fusion process. Verify that the processor is calibrated per the manufacture.
4. Using a permanent marker, apply witness marks to the pipe where the fitting will be installed. This will help identify unscraped pipe surface areas.
5. Pipe ends should be square for coupling installation, clean and scrape all pipe surfaces that will come into contact with fittings, scrape to remove all permanent marked lines.
6. Scrape the outside pipe surface removing a minimum of .007" to remove oxidation and contaminants. CAUTION: Do not remove more than 10% of the wall thickness or the section pipe shall be removed from service.
7. Do not touch scraped pipe.
8. Remove fitting from bag. Clean scraped fitting area on pipe and EF fitting with isopropyl alcohol wipe and allow to dry completely. If areas are touched or contaminated after cleaning, the area must be cleaned again with isopropyl alcohol wipe. (**Use only isopropyl alcohol wipes to clean fittings or scraped pipe areas**).
9. Insert pipe ends to center of coupling and mark stab depth or center the saddle fitting on scraped section of pipe.
10. Clamp pipe or fitting in place.
11. Turn on processor and then attach processor leads to fitting.
12. Verify time on fitting to be fused.
13. Electrofuse fitting following EF processor instructions.
14. Remove leads and note cooling clamp removal time.
15. Refer to manufacturer for cooling times.
16. **Mark all electrofusions with fuser ID using permanent marker.**

# Plastic Fusion

## Joining PE 2406/2708 MD Plastic Pipe and Fittings

Utah | Wyoming | Idaho



**WARNING:** Federal safety regulations require persons making joints in gas systems must be qualified in the pipeline operators qualified fusion procedures (CFR 49, Part 192).

DuPont Aldyl "A" (Pink or Grayish in Color)
YES - Squeeze
<b>Note:</b>
<ul style="list-style-type: none"> <li>• Reinforce all squeezed areas on all Aldyl "A" DuPont pipe 1-1/4 inch and larger with reinforcement clamp.</li> <li>• When cutting into Aldyl "A" pipe 1-1/4 inches and larger that was installed between 1970-1975, a minimum 6 inches of pipe shall be cut out and sent to Operations Training Department (TRN01) to determine if cracking, i.e. Low Ductile Inner Wall Cracking exists (LDIW).</li> </ul>
YES - Electrofusion
<b>NO - Lycofit fittings</b>
<b>NO - Butt Fusion, conventional Socket or Saddle fusion</b>