PERFORMANCE PIPE
A DIVISION OF CHEVRON PHILLIPS CHEMICAL COMPANY LP

www.performancepipe.com

TECHNICAL NOTE PP 750-TN-05
BUTT FUSION JOINING PROCEDURES
For DriscoPlex® Municipal/Industrial/Gas/Energy Piping Products

This bulletin has been developed to assist those responsible for the butt fusion joining of Performance Pipe products in municipal, industrial, gas and energy applications. For more specific fusion information and safety requirements, saddle fusion procedures, socket fusion procedures and Federal regulations, please refer to Performance Pipe Bulletin PP 750 "Heat Fusion Joining Procedures and Qualification Guide." This procedure is in alignment with ASTM F2620.

OVERVIEW

In heat fusion joining, mating surfaces are prepared by cleaning and facing, and simultaneously melted with a hot-plate heater. The heater is removed and the melted surfaces are pressed together and held under pressure. As the molten materials cool, they mix and fuse into a permanent, monolithic joint.

SET-UP PARAMETERS

HEATING TOOL SURFACE TEMPERATURE — MINIMUM 400°F – MAXIMUM 450°F (204 – 232°C)

Heating tool surfaces must reach the specified temperature range before you begin. This includes any and all points that will come in contact with the pipe. Heating tool surfaces must be clean to allow proper fusion.

GAUGE PRESSURE

Gauge pressure is the pressure required for fusion. For hydraulic machines, the gauge pressure is a function of interfacial pressure, fusion surface area, machine's carriage cylinder size and drag pressure. When calculated, gauge pressure is what the operator will input into the fusion machine. The total effective piston area can be obtained from the machine manufacturer. The drag pressure is the pressure that is required to overcome movement in the carriage. ***Interfacial pressure and gauge pressure are not the same.*** Manually operated machines do not require a calculation for gauge pressure. Below is the equation used to calculate for Gauge Pressure in psi. A slide rule or a gauge pressure calculator obtained from the machine's manufacturer can be a substitute for this calculation.

$$\mathbf{P_G} = \frac{\left[\mathbf{OD^2} \times \boldsymbol{\pi} \times \left(\frac{\mathbf{1}}{\mathbf{DR}} - \frac{\mathbf{1}}{\mathbf{DR^2}}\right)\right] \times \mathbf{IFP}}{\mathbf{TEPA}} + \mathbf{P_D}$$

P_G = Gauge Pressure, psi
OD = Outside Diameter, in.
DR = Dimension Ratio
IFP = Interfacial Pressure, *60 – 90 psi (4.14 – 6.21 bar)*
P_D = Drag Pressure, psi
TEPA = Total Effective Piston Area, in^2

PROCEDURE

1. ***Secure.*** Clean the inside and outside of the component (pipe or fitting) ends by wiping with a clean, dry, lint-free cloth or paper towel. Align the component ends in the machine. ***Do not force pipes into alignment against open fusion machine clamps.*** Component ends should protrude past the clamps enough so that facing will be complete. Bring the ends together and check high-low alignment. Adjust alignment as necessary by tightening the high side down. Make sure clamps are properly secured to prevent slippage of the component ends.

Performance Pipe, a division of Chevron Phillips Chemical Company LP | 5085 W. Park Blvd | Suite 500 | Plano, TX 75093 | Phone: 800-527-0662 | Fax: 972-599-7329

2. ***Face.*** Place the facing tool between the component ends and face them to establish smooth, clean, parallel mating surfaces. If stops are present, face down to the stops. Remove all shavings from pipe ends after facing. ***Do not touch the component ends after facing.***

3. ***Align.*** Bring the component ends together, check alignment and check for slippage against fusion pressure. Look for complete contact all around both ends with no detectable gaps and outside diameters in high-low alignment.

4. ***Melt.*** Verify that the heating tool is between 400°F- 450°F. Place the heating tool between the component ends and move the ends against the heating tool. The initial contact should be under fusion pressure to ensure full contact. Once full contact is made, hold the ends against the heating tool ***without force.*** For hydraulic machines, ensure that no pressure has been captured in the cylinder.

   Beads of melted polyethylene will form against the heating tool at the component ends. When the proper melt bead size is formed, quickly separate the ends and remove the heating tool.

Table 1. Melt Bead Size

Pipe OD, in (mm)	Approximate Melt Bead Size, in (mm)
< 2.37 (60)	1/32 (1)
≥ 2.37 (60) < 3.5 (89)	1/16 (1.5)
> 3.5 (89) < 8.62 (219)	3/16 (5)
> 8.62 (219) to < 12.75 (324)	1/4 (6)
> 12.75 (324) to ≤ 24 (610)	3/8 (10)
> 24 (610) to < 36 (900)	7/16 (11)
> 36 (900) to ≤ 65 (1625)	9/16 (14)

*****Please note that for 14" and larger pipes, a minimum heat soak time of 4.5 minutes per inch of pipe wall thickness and the minimum melt bead size must be achieved.***

5. ***Join.*** Immediately after removing the heating tool, ***QUICKLY*** inspect the melted ends and then bring them together, applying the correct joining force and using the calculated Gauge Pressure. ***Do not slam the ends together.*** The correct joining force will form a double bead that is rolled over to the surface on both ends.

6. ***Hold.*** Hold joining force against the ends until the joint is cool. Maintain fusion pressure against the pipe ends at a minimum cool time rate of 11 minutes per inch of pipe wall thickness. Avoid pulling, installing, pressure testing and rough handing for at least an additional 30 minutes. Heavier wall thickness pipes may require longer cooling times.

7. ***Inspect.*** On both sides, the double bead should be rolled over to the surface and be uniformly rounded and consistent in size all around the joint. If equipped, verify joint via a Data Logger.

It is a common practice and accepted industry "Rule of Thumb" when fusing pipes of unlike Dimension Ratio (DR) to fuse a maximum mismatch of **one** SDR. For example, this would allow fusion of DR 11 pipe to DR 9 or DR 11 to DR 13.5. A successful fusion may be accomplished without the need of any change in the actual fusion procedure. When fusing unlike DR values, the fusion pressure is calculated to the higher DR number.

Per ASTM, Standard Dimension Ratio (SDR) value is when the outside diameter divided by the minimum wall thickness equals one of the following values:

5.0	6.0	7.3	9.0	11.0	13.5	17.0	21.0	26.0	32.5

The terms DR and SDR are often used interchangeably.

NOTICE. This publication is for informational purposes and is intended for use as a reference guide. It should not be used in place of the advice of a professional engineer. This publication does not contain or confer any warranty or guarantee of any kind. Performance Pipe has made every reasonable effort towards the accuracy of the information contained in this publication, but it may not provide all necessary information, particularly with respect to special or unusual applications. This publication may be changed from time to time without notice. Contact Performance Pipe to ensure that you have the most current edition.