HIGH COUNTRY FUSION, a DIVISION OF CONSOLIDATED PIPE & SUPPLY CO. INC.

SYMAL-FUSE™ DUAL CONTAINMENT HDPE PIPING SYSTEM

GENERAL WELDING PROCEDURES 4710 MATERIALS

I. INTRODUCTION

High Country Fusion's Symal-Fuse™ System is a dual containment piping system. HDPE is a thermoplastic material that is joined through thermoplastic heat butt fusion welding. A weld results when HDPE is "squeezed" together with heat and pressure. The weld zone must be clean and dry, and the material must be properly aligned. The standards for butt fusion welding is ASTM F2620-19 and PPI TR-33, and are referenced below.

"High-points" of the Simultaneous Butt Fusion-Welding procedure:

- Symal-Fuse™ simultaneously welded systems install very much like single wall piping. This provides a system that contractors can install without a steep learning curve.
- Symal-Fuse™ pipe and fittings are designed for simultaneous butt fusion welding where both pipes are welded at the same time.
- The Symal-Fuse™ Simultaneous Butt Fusion Procedure follows the visual practice for single wall butt fusion welding as identified in ASTM F2620-19 Guidelines for Polyolefin Thermoplastic Butt Fusion Heat Welding and PPI TR-33. By making sure that both containment pipe and carrier pipe have wall thicknesses that are within 20% of each other, getting a good double fusion can be obtained easily using standard fusion practices.

II. Symal-Fuse™ WELDING PROCEDURE

1. Check the fusion parameters for your pipe and fittings. Fusion temperature for standard HDPE material is 425°F. The butt fusion interfacial pressure at the pipe ends for standard HDPE material is 75 psi +/- 25 psi. Actual fusion equipment gauge pressure will vary depending on the equipment manufacturer, the pipe SDRs and the pipe diameters. Refer to the specific operating instructions for the equipment that is being used for the specific operating procedures. For example, a McElroy hydraulic fusion machine (a #28 machine and larger) with the hydraulic manifold must have the fusion pressure set, the heat soak pressure set, and the facing pressure set. The understanding and use of the manifold shifting sequence is essential to a good weld. Whereas a Christie fusion machine with a

hand pump hydraulic system uses a single gauge that is checked for the different pressures during the welding cycle. If using McElroy fusion equipment, go to http://www.mcelroy.com/en/university/videos.htm and review both the Theory of Fusion and the Determining Drag Pressure so you make sure you understand the Butt Fusion process.

2. Symal-Fuse™ pipe and fittings are designed for simultaneous butt fusion welding. Both carrier and containment pipes are joined at the same time.

3. Symal-Fuse™ Ends are welded to the carrier and containment pipes on one end to prevent any movement between the two pipes. In this manner pressure can be applied evenly to both pipe ends. Centralizers are the pipe support and guidance system for the carrier pipe. An end spacer is used on the non-Symal-Fuse™ end to center the pipe so that the fusion surfaces between the Symal-Fuse™ end and the non-Symal-Fuse™ end are correct.

4. Check the fit of the heater in the fusion machine and check the heater surface condition. Plug in the heater and the fusion machine itself. Check the equipment for proper operation and sufficient power. Make sure that the heater is hot enough per the specific fusion parameters for your pipe and fittings before beginning the welding process. Wipe off the heater face with a clean, dry cotton cloth (synthetics will melt) before each weld with no exceptions.

5. The next step is called "facing the pipe". The facer is a rotary planer that "shaves" the pipe ends to provide clean, parallel pipe ends. Proper facing is critical in any butt- fusion procedure. Before facing, wipe the pipe ends with a clean, dry cotton cloth. Once facing is complete, all four pipe ends will be smooth, clean, and parallel. Remove the pipe shavings and using approved HCF Isopropyl wipes (preferred) or a fresh, clean, dry cotton cloth, wipe the pipe ends again. Make sure no contamination such as oil, dust, dirt, water, etc. are on the pipe ends.

7. After facing the pipe ends, remove facer and check alignment of the containment pipe by bringing the pipe ends together.

8. The pipe ends are then separated so the heater can be placed in the fusion unit. Wipe off the heater face with a clean, dry cotton cloth (synthetics will melt) before each weld with no exceptions. The heater is placed in the fusion unit. The pipe ends are then brought in direct contact with the heater plate. Check to make sure that the containment pipe ends are in full contact with the heater on both sides, **Fusion Pressure is** applied at this time and fusion

pressure must be maintained until a slight melt is observed around the circumference of the pipe before releasing pressure to generate the start of the heat soak cycle.
PRESSURE MUST BE RELEASED TO ZERO FOR THE HEAT SOAK CYCLE. If using McElroy Equipment please refer to http://www.mcelroy.com/en/university/videos.htm **and review the "shifting procedure" animation to make sure you understand the procedure.** The pipe material absorbs heat before fusion pressure is applied. A bead of material will form as the pipe heats up and "flares" outward from the expansion of the pipe end. The weld bead formation is observed and indicates the pipe is hot enough. The weld bead should be uniform around the pipe OD. Correct weld bead formation and size indicates sufficient heat soak.
ASTM F2620-19 has BOTH heat and cooling cycle time parameters that should be followed based on the OD and wall thicknesses. The welding pressure for the Symal-Fuse™ DCS pipe is a combined fusion pressure for both the internal pipe and the external pipe, based on pipe size, SDR and the type of equipment that is being used. Please consult with your supplier for the recommended fusion pressure.

9. When the weld bead is formed evenly around the pipe ends and has been in contact for the prescribed time per ASTM F2620, then the heater is removed

10. A Q.C. check is done when the heater is removed. The pipe ends are inspected. The weld bead will have formed on the ID as well as the observed bead on the OD of the containment pipe and on both the OD and ID of the carrier pipe. The pipe end itself should be flat or slightly convex with the bead flaring away from the pipe ends. A concave profile on the end of the heated pipe is not acceptable. **The maximum amount of open time with the heater removal is covered in ASTM F2620-19.**

11. The pipe ends are brought together at this time. Follow the equipment operation instructions for applying fusion pressure. As fusion pressure is applied the weld bead roll-back is observed. When the bead has properly rolled-back, lock the machine so pressure is constant on the joint until it has cooled per ASTM F2620-19 cooling times for external pipe

12. At this point the fusion weld is nearly complete. The pipe weld has only to cool down. The pipe can be removed from the fusion equipment when your thumb nail can no longer leave an indentation in the weld beads.

These parameters are true for all cell classification minimum values of 445474C per ASTM D 3350, PE 4710 HDPE material.