

TECHNICAL NOTE PP 750-TN-06

SADDLE FUSION JOINING PROCEDURES

For DriscoPlex[®] Municipal/Industrial/Energy Piping Products

This bulletin has been developed to assist those responsible for the saddle fusion joining of Performance Pipe products in municipal, industrial, gas and energy applications. For more specific fusion information and safety requirements, 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 saddle fusion the pipe and fitting are simultaneously melted with a heating tool under the calculated Initial Heat Force (Bead Up Force) and Heat Soak Force then joined together under Fusion Force. After maintaining fusion force for the required cooling time, the pipe and fitting are removed. The molten material thus cools into a permanent and monolithic joint.

SET-UP PARAMETERS

HEATING TOOL SURFACE TEMPERATURE — MINIMUM 490°F – MAXIMUM 510°F (254 – 266°C)

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

FUSION MACHINE AND HEATING TOOL

Select a saddle fusion machine (application tool/unit) with an appropriate clamp for the pipe and saddle fitting. Use a main bolster or support for 6” IPS (160 mm) and smaller pipe. Select a heating tool with faces contoured and correctly sized for the pipe and the fitting base. When saddle fusing to a pressurized pipe, the saddle fusion machine must have a gauge or mechanism that indicates the force applied when the saddle base is pressed against the heating tool or the pipe.

INITIAL HEAT FORCE AND FUSION FORCE

The Initial Heat Force (IHF), also known as the Bead-up Force, is the force applied to form an initial melt pattern on the main and the fitting base. It’s found by multiplying the fitting base area, in², by the Initial Interfacial Pressure of 60 lb/in². The Heat Soak Force (HSF) is applied after the initial melt pattern is observed on the pipe and is the minimum force, usually zero pounds, to ensure contact between the heater and fitting. The Fusion Force (FF) is essentially the joining force that is applied to the fitting against the main immediately after the heating tool is removed. The Fusion Force is half the bead-up force. **Please note that a fitting label (IHF/HSF/FF) obtained from the saddle fitting or fitting’s manufacturer can be a substitute for this calculation.

$$IHF = L \times W - (0.785 \times d^2) \times 60$$

$$IHF = 0.785 \times (D^2 - d^2) \times 60$$

$$FF = \frac{IHF}{2}$$

- IHF = Initial Heat Force, lbs.
- L = Rectangular Base Length, in.
- W = Rectangular Width Length, in.
- D = Outlet Hole Inside Diameter, in.
- d = Round Base Outside Diameter, in.

PROCEDURE

1. **Prepare and Clean.** Select and install the heating and saddle fusion tool according to the pipe and fitting base size. Abrade the fusion surface of the fitting base and the mating fusion surface of the pipe with a 50-60 grit utility cloth. On the pipe surface, abrade the surface area that is the size of the fitting base plus about 1/2" (13 mm) per side all around to completely remove a thin layer of material from both surfaces. After abrading, brush the residue away with a clean, dry cloth. Do not touch the abraded and cleaned surfaces with your hands.
2. **Heat.** Verify that the heating tool is between 490°F- 510°F. Place the heating tool on the pipe centered beneath the fitting base and immediately lower the fitting against the heater face. **Do not slam** the fitting against the heating tool. Quickly apply the calculated Initial Heat Force and begin timing. At the first visual indication of melt between heating tool face and the crown of the pipe, reduce force to Heat Soak Force (zero force) and continue timing. Heat the pipe and fitting until the indicated total heating time expires or a melt bead of 1/16" is visible around the fitting base, see **Table 1**.
3. **Join.** When the heating time ends, separate the heating tool from the fitting and the pipe and remove the heating tool. Quickly inspect the melt on the pipe and fitting base. Within 3 seconds move the fitting against the pipe and apply the calculated Fusion Force.
4. **Hold.** Maintain the Fusion Force for 5 minutes on IPS 1¼" (42 mm) and for 10 minutes on larger sizes. Cool undisturbed for an additional 30 minutes. During this time avoid pressure testing, rough handling, tapping and connecting to the branch outlet.
7. **Inspect.** Visually check the fusion bead around the entire fitting base at the main pipe. The fusion bead should be uniformly sized all around the fitting base and should have a characteristic "three-bead" shape. The first bead is the fitting base melt bead. The second or outermost bead is produced by the edge of the heating tool face on the main. The third or center bead is the main pipe melt bead. The first and third beads should be about the same size all around the fitting base. If the melt on the main pipe or the fitting base was unacceptable, the saddle fusion should not be placed in service.

Table 1. Saddle Fusion Parameters

Sequence	Parameter
Heater Adapter Surface Temperature	500 ± 10°F (260 ± 6°C)
Initial Interfacial Pressure	60 ± 6 psi (4.14 ± 0.41 bar); <i>Calculate or See Fitting Label</i>
Heat Soak Interfacial Pressure	0 psi; <i>Calculate or See Fitting Label</i>
Fusion Interfacial Pressure	30 ± 3 psi (2.07 ± 0.20 bar); <i>Calculate or See Fitting Label</i>
Total Heating Time on Pressure Main – 1-1/4" IPS	15 seconds Max
Total Heating Time on Pressure Main – 2" IPS	25 to 35 seconds Max
Total Heating Time on Non Pressure Main – 1-1/4" and 2" IPS Total Heating Time on Pressure/Non Pressure Main – 3" IPS and Larger	Look for a 1/16 in (1.6 mm) bead around the fitting base

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