

Technical Bulletin

Reasons for Incomplete or Uneven Melt Pattern During Sidewall Fusion

The process of attaching sidewall fittings on polyethylene pipe using the fusion process usually requires very specialized equipment. Using good equipment, proper procedures, and the right pipe and fittings are important to ensure a good fusion joint. One problem that occasionally occurs is an incomplete or uneven melt pattern on the pipe or fitting during the melt process. The following list identifies reasons for this condition and possible ways to prevent or solve the problem.

Pipe Curvature

Pipe curvature and pipe ovality are the most common cause of uneven or asymmetric heater melt patterns. All heater faces are rigid. When the face is brought into contact with a pipe surface that is not straight or round, contact will not be uniform. This results in an uneven melt pattern. The problem can be severe enough to result in areas of the pipe with no melt.

Pipe curvature may be caused by installing coiled pipe without straightening or laying pipe into a poorly prepared trench surface. Whether the pipe is curved laterally or vertically it can still cause a poor fit between the heater face and the pipe. A poorly prepared trench can have rocks or undulations that will curve the pipe.

Possible Field Solutions

To correct the pipe curvature problem, the pipe must be straightened. It can be temporarily corrected by used mechanical means to bend the pipe into a straight position during the fusion process. The use of a rounding shell or chain may help straighten the pipe. A rounding shell is usually a half-round clamp that fits on the side of the pipe opposite of the fitting application point. On larger pipe a chain shell with a half shell bolster may help. Good trench preparation will prevent most trench-related problems.

Ovality

Pipe ovality is when the diameter of the pipe varies at one location on the pipe. The orientation of the high and low points on the pipe to the heater face will change the appearance of the melt pattern. Ovality can be caused by several factors, some related to manufacturing and some related to storage and handling. ASTM D2513 specifies the maximum allowable ovality for polyethylene pipe for gas applications.

Possible Field Solutions

Repositioning or rotating the pipe can sometimes improve the heater face to pipe fit. Clamp style cold rings can usually re-round the end of an oval pipe for socket fusion; however, it is more difficult to re-round pipe away from the ends. As stated above for correcting pipe curvature, the use of a rounding shell or chain shell with bolster may help to round the pipe.

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Misalignment of the Heater Face With the Pipe

The four major causes of this problem are 1) a stiff or sticking swivel mechanism on the fusion tool, 2) misalignment of the heater iron to the centerline of the pipe, 3) poor (uneven or loose) attachment of the heater face to the heater and 4) the wrong size heater face has been installed.

Possible Field Solutions

Check the heater face to ensure that it is the proper size and installed correctly. Check the fusion tool to be sure it operates properly and has been secured to the pipe in the appropriate manner.

Misalignment of the Fitting in the Fitting Holder

A poorly aligned fitting can apply an uneven load to the pipe during the melt process. This will cause an uneven melt pattern.

Possible Field Solutions

Always check the fitting for alignment with the pipe prior to the melt process. Be sure that the fitting is securely held in the fitting holder.

Misalignment or Side Load on the Fusion Tool

Side loading or other strain on the fusion tool during the fusion process can result in an uneven melt pattern. Also, using parts or equipment that do not allow good alignment between the fusion tool and the pipe will cause an uneven load on the heater face. Ideally, in most cases, the load on the heater face during melt and then the fitting during fusion should pass through the centerline of the pipe.

Possible Field Solutions

Confirm proper machine and heater face alignment before heat-up. If the machine is not vertical, support the weight of the machine with some form of support.

Uneven Heating of the Heater Iron

This can be caused by a faulty heater element that would result in a variation in temperature across the heater face. A gap or some other form of insulation between the heater iron and the heater face can also cause a variation in heat transfer to the surface of the pipe. Locate this problem with a pyrometer. During heat-up measure the temperature of the surface of the face at five-minute intervals and record the temperatures at different locations on the heater face. Large variations may indicate a bad heating element or poor thermal contact between the face and the heater iron.

Heater Faces Not Made to the Correct Dimensions

Although unlikely, this is a possible reason for an incomplete melt pattern. The most likely cause for this is that the heater faces have been marked for the wrong size pipe.