Side-Wall Fusion

Side-wall fusion is a process that allows branch outlets of smaller diameter pipes to be fused to the side-wall of a larger main pipe line. The side-wall procedure for polypropylene and polyethylene can be accomplished by using the manufacturer's suggested equipment. Size, availability, and pricing can be obtained through Asahi/America representatives.

The following steps, along with machine instructions, should be carried out to complete the fusion process:

1. Install fusion machine on the pipe (main).
2. Clean the pipe with a clean cotton cloth. Prepare surface of pipe (main) by roughing with emery cloth or equal abrasive.
3. Prepare the base of the main and tighten clamp.
4. Align branch on main and tighten clamp.
5. Check branch for square alignment on main.
6. Retract moveable clamp, roll, and center heater plate with adapter between base of branch and main.
7. For all sizes, apply a strong, firm, continuous pressure until complete melt bead can be seen on the main. Release pressure to light pressure. Continue heat soak cycle until allotted time occurs.
8. Retract moveable clamp and cleanly remove heater plate.
9. Bring melted surfaces together within allotted time. Gradually apply continuous pressure until the proper pressure is reached. Maintain pressure until joint cools and hardens.

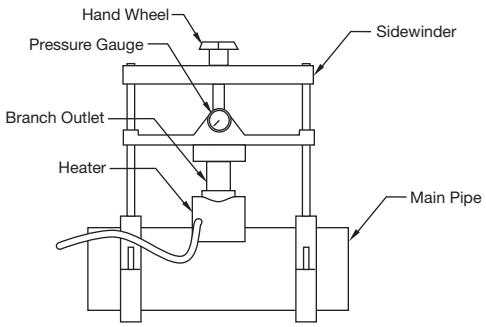

Figure F-25. Fixture for side wall fusion

Hand-Held Welding

Welding Instructions

The Process in General

Hot air (gas) welding is the process of fusing a bead of material against a like material. This welding is common with sheet fabrication and applications not requiring pressure resistance. Asahi/America uses hot air (gas) welding to locate support discs for pipe centering in its Duo-Pro system.

In hot air (gas) welding, the heat transfer medium is a heated gas, either nitrogen or clean air. Originally the use of nitrogen proved most successful, preventing material contamination and oxidation. With today's material quality and equipment technology, nitrogen is becoming less common, except with critical materials. The combination of clean, oil, and moisture free air with the controlled temperature proves equally successful, eliminating the continuous expense of the inert gas. The temperature of the hot air ranges between 300° C – 350° C for HDPE and 280° C – 330° C for PP, when outside welding conditions are about 20° C. The temperature range will vary with changing ambient conditions.

To accomplish high-quality welds, it is important the fillers (welding rod) are of the same material and type. The most common welding fillers are 3 mm and 4 mm round. There are also special profiles, such as oval and triangular rods. The welding tip used must also match the cross section of the welding rod.

Processing Guidelines

Install welding tent or equivalent if weather conditions suggest. A good weld requires proper preparation of the material. The part should be free of any impurities such as dirt, oil, etc. Additionally, some thermoplastics develop a thin layer of oxidized molecules on the surface that require scraping or grounding of the material. Another effect, especially with HDPE, is the migration of unchained lower density molecules to the surface caused by internal pressure of the material. This gives the usually "waxy" surface appearance of HDPE. Grinding or scraping of the surface is required. Wipe off any dust with a clean cloth. Do not use solvents or cleaners; they introduce chemicals with unknown and likely negative effects.

The forms of the welding seams on plastic components generally correspond with the welding seams on metal parts. In particular, pay attention to the general principles for the formation of the welding seams. The most important welding seam forms are: V-weld, Double V-weld, T-weld, and Double T-weld.

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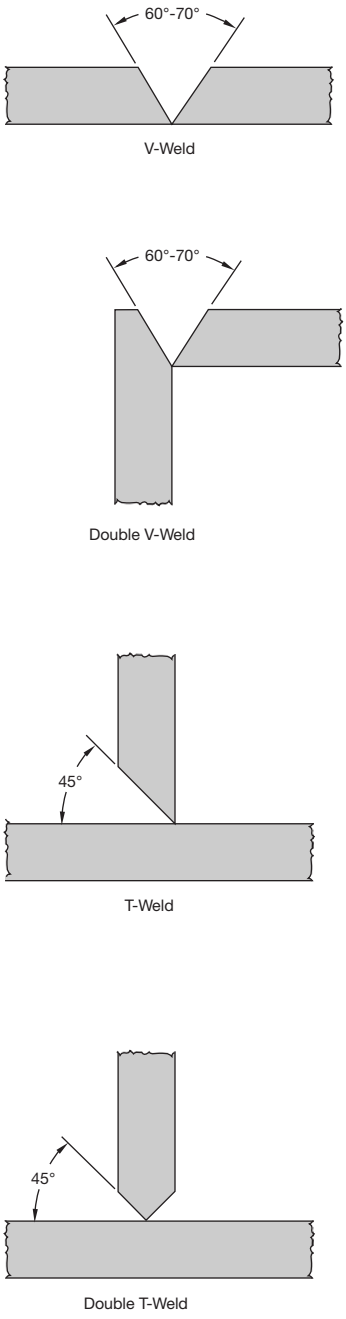

Figure F-26. Typical welding seam forms

Tack Welding
The initial step in the welding process is the "tack weld." The objective is to put the parts into place, align them, and prevent any slippage of the material during the structural welding process. Welder should use own discretion when applying an intermittent or continuous tack. Larger structures and thick gauged materials may require addition clamping.

High-Speed Welding
In this process a filler material, the welding rod, is introduced into the seam to give supportive strength. Standard rod profiles are round or triangular. Triangular rod is a single supportive weld and does not allow for the kind of surface penetration achieved with round welding rod.

Round welding rod is used where heavy-duty welds are required. It allows the fabricator to lay several beads of welding rod on top of each other. This way, a relatively thin welding rod can be used to produce a strong weld.

By performing a few practice welds, the welder will develop speed and force necessary to complete a successful weld. Heat the welding rod within the rod-drawing nozzle and push into the welding groove. The force applied on the rod controls the speed of the welding. The operator should look for a small bead of melted rod on both sides. Apply additional welds to fill the groove.

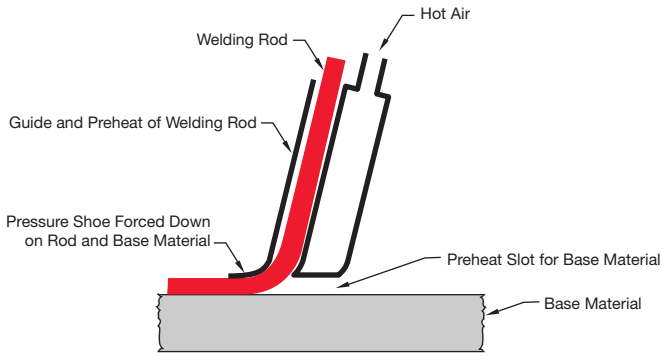

Figure F-27. High-speed welding process

Free Hand
The oldest method of welding filler rod. This process is much slower than high-speed welding, but it must be used where very small parts are being welded, or where the available space prohibits the use of high-speed welding tips. The only nozzle used in this process is a small jet pipe with an opening of 1/8" or 5/32" to concentrate the heat. The welder performs a waving action of the nozzle at the base material and the welding rod with an "up and down" and "side to side" motion to bring the rod and material to melting form. Hand apply pressure vertically at 90° to begin. After reaching the correct amount of pressure and heat to the rod and base material, a small wave of molten material forms in front of the welding rod. If bent backward, the

welding rod will stretch and thin out; if bent forward, no wave will occur in front, resulting in insufficient pressure. Free-hand welding requires a highly skilled operator and should be avoided if a simpler method can be used.

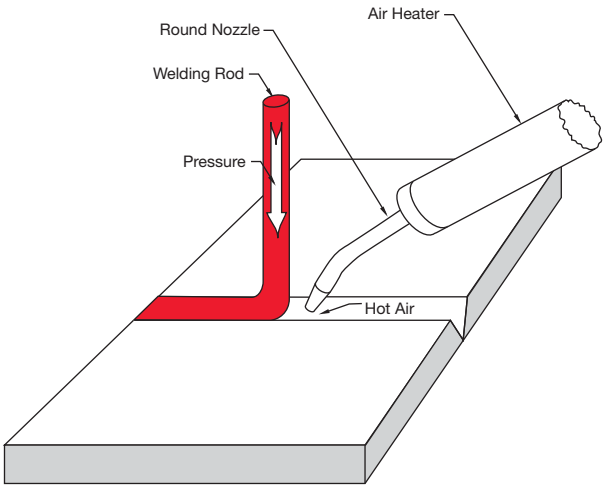

Figure F-28. Free-hand welding

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Extrusion Welding

Extrusion welding is an alternative to multiple pass hand welding and can be used whenever physically possible to operate the extruder. Extrusion welding is used for joining low pressure piping systems, construction of tanks and containers, for joining liners (for buildings, linings for ground work sites), as well as special tasks.

This welding technique is characterized as follows:

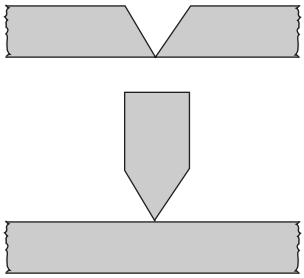
1. Welding process is performed with welding filler being pressed out of a compound unit.
2. The welding filler is homogenous with the material being joined.
3. The joining surfaces have been heated to welding temperature.
4. Perform joining under pressure.

Welding Seams

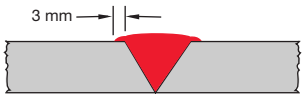
Prepare adequately before welding (e.g., scraping or grinding). Do not use solvents or cleaners; they introduce chemicals with unknown and likely negative effects.

When choosing welding seam forms, consider the general technical principles for welding seam formations shown in Figure F-29.

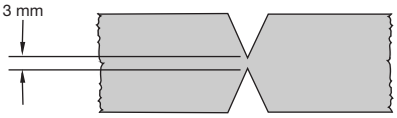
Qualification of Welder and Requirement on Welding Devices
The plastic welder must have the knowledge and level of skill required for the performance of the welding process. The operator performing the welding must be a trained, certified welder.



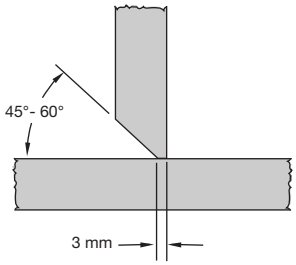
Welding Seam Forms for Extrusion Welding



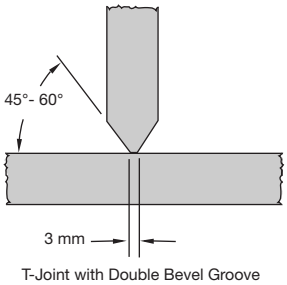
V-Weld without Sealing Run



Double V-Butt Welding



T-Joint with Single Bevel Groove with Fillet Weld



T-Joint with Double Bevel Groove

Figure F-29. Typical welding seam forms

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