

The butt welding method of joining polyolefin pipe requires application of a combination of appropriate temperature, time and pressure to ensure a sound weld.

Operators should take care to determine the suitability of materials for butt welding. Join only pipes and fittings made from the same raw materials, eg PE to PE, PP to PP, PVDF to PVDF, etc.

The joint area must always be protected from adverse weather conditions, eg dampness, excessive cold or heat, or strong winds, which could lead to the pipe wall developing non-uniformly heated zones.

The weld zone should be free of bending stress, free of notches or similar damage, and be free of contamination.

In the absence of an Australian Standard on butt welding, a table of welding parameters is given on the next page.

### The basic welding process

- Prepare the ends of the pipe or fittings to be joined so they are clean and parallel to each other.
- Heat the ends at pressure  $P_1$  and for time  $T_1$  to melt the plastic until a bead just forms completely around both ends.
- Heat soak the ends at pressure  $P_2$  and for time  $T_2$ . (Time  $T_1 + T_2$  is critical to achieving good weld quality and should never be shortened.)
- Remove the heater plate and bring the pipe ends gently into contact with each other within time  $T_3$ . (If  $T_3$  is too long, too much heat is lost from the weld area allowing PE recrystallization to commence prematurely.)
- Raise the pressure gradually to pressure  $P_3$  within time  $T_4$ . (If pressure is applied too fast it can cause too much melt to be forced out of the weld area with adverse results.)
- Maintain pressure at  $P_3$  for time  $T_5$  before unclamping and removing pipe from the machine. Never artificially accelerate the cooling process.

### Weld test - destructive

Cutting out and testing of trial welds is frequently required to qualify the welding machine, operator, welding parameters, pipe material, or when the consequences of failure are significant.

Tensile testing is widely used. The ratio of ductile:brittle appearance is usually indicative of weld acceptability.

### Weld failure trouble shooting



Uniform bead - correct welding.



Crack down centre of bead.

"Cold weld" signified by clean break through the middle of the weld with a smooth appearance.

*Could be due to insufficient heat soak time or temperature, or changeover time too long, or excessive soak pressure, or insufficient fusion pressure, or no allowance for drag pressure, or drag pressure too great eg due to pulling pipe up a gradient.*



Misalignment - maximum allowable 10% of wall thickness.

*Care should also be taken to ensure pipes or fittings being joined have the same diameter and wall thickness or the probability of weld failure is significantly increased.*



Insufficient bead roll over.

*Could be due to insufficient heat soak time or temperature, or changeover time too long, or insufficient fusion pressure, or no allowance for drag pressure,*



Unequal bead size.

*Look for temperature gradients e.g. pipe surface in the hot sun vs pipe in the shade, or heater plate hot spots.*

*Look for unequal application of pressure.*

*If unequal uniformly around the whole circumference, look for physical difference in materials being joined eg melt flow index.*

Butt welding equipment is designed to apply the temperatures and pressures specified by the parameters. As the conditions of use of welding equipment are outside the control of Dixon Industries, no warranties are expressed or implied and no liability is assumed in connection with the use of butt welding equipment or the butt welding guidelines or parameters.