

# Butt Fusion Weather Guidelines

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Butt fusion can be successfully performed over a broad range of weather and temperature conditions. However, some weather, wind and temperature conditions can affect equipment operation, or equipment performance, or can introduce contaminants that can compromise joint quality. Temperature conditions can affect pipe temperature. Joining procedures and times may need to be adjusted to compensate for weather or pipe temperature.

Heating plate temperature and joining pressure are never changed to compensate for weather or temperature conditions.

This WL114 publication is to be used in conjunction with WL101 *Joining & Field Procedures for Pipe* for fusion joining procedures and additional information.

See also WL111 *Unloading Guidelines for WL Plastics Polyethylene Pipe* for pipe unloading and handling information.

### Wind Effects

Exposing fusing equipment and the fusing process to wind can result in reduced or uneven fusion heater plate surface temperatures, can prematurely cool melted pipe ends, or can blow contaminants such as dust, dirt and debris into the joint. A wind break or shelter should be considered when jobsite wind intensity exceeds “gentle breeze” conditions. The Beaufort Wind Intensity Scale (pictured right) provides guidance for estimating wind conditions. Wind intensity above “strong breeze” may require suspending fusing operations.

Exposing the fusion heater plate or parts of it to excessive wind can result in unacceptable temperature variations across the heater plate surface that can result in unevenly melted pipe ends and compromised fusion joint quality. Excessive wind can prematurely cool melted pipe ends that are exposed during heater plate removal, or can blow contaminants such as dust, dirt, and debris onto the melted pipe ends. Premature cooling and contamination can compromise fusion joint quality.

Winds can blow into exposed pipe ends and travel through the pipe bore, which can cool heater surfaces and pipe end melt, or deposit contamination at the joint. To prevent flow through the pipe bore, open pipe ends may require plugs or covers.

Beaufort*	Avg Miles per Hour	Knots	Surroundings
0 calm		0 - 1	Smoke rises vertically and the sea is mirror smooth
1 light air	1.2 - 3.0	1 - 3	Smoke moves slightly with breeze and shows direction of wind
2 light breeze	3.7 - 7.5	4 - 6	You can feel the breeze on your face and hear the leaves start to rustle
3 gentle breeze	8.0 - 12.5	7 - 10	Smoke will move horizontally and small branches start to sway. Wind extends a light flag
4 moderate	13.0 - 18.6	11 - 16	Loose dust or sand on the ground will move and larger branches will sway, loose paper blows
5 fresh breeze	19.3 - 25.0	17 - 21	Surface waves form of water and small trees sway
6 strong breeze	25.5 - 31.0	22 - 27	Trees begin to bend with the force of the wind and causes whistling in telephone wires. Some spray on the sea surface
7 moderate gale	32.0 - 38.0	28 - 33	Large trees sway. Moderate sea spray
8 fresh gale	39.0 - 46.0	34 - 40	Twigs break from trees, and long streaks of foam appear on the ocean
9 strong gale	47.0 - 55.0	41 - 47	Branches break from trees
10 whole gale	56.0 - 64.0	48 - 55	Trees are uprooted and the sea takes on a white appearance
11 storm	65.0 - 74.0	56 - 63	Widespread damage
12 hurricane	75+	64 +	Structural damage on land, and storm waves at sea

## ***Precipitation and Airborne Contaminants***

Fusion joining operations must be protected against precipitation such as rain, snow, sleet and hail, and airborne contamination such as blowing dust, dirt, sand and debris. An overhead canopy may be sufficient in light precipitation. A fully enclosed shelter is appropriate when precipitation is heavier. Airborne contamination generally occurs in higher wind intensity conditions. Fusion operations should be suspended if wind driven precipitation or airborne contamination cannot be kept away from fusion operations.

## ***Temperature Effects***

Polyethylene pipe is ductile to temperatures well below -50°F (-46°C), and retains significant toughness in sub-freezing conditions. However, all materials including polyethylene become less flexible and more sensitive to cutting and impact in freezing and sub-freezing conditions. In very cold conditions, PE pipe will be harder to straighten or bend. When cutting PE pipe with a saw, bending the pipe to open the cut can cause the pipe to fracture through before the cut is complete. PE pipe should be properly handled and placed – not dropped – where it needs to be. In very cold conditions, dropping the pipe can result in pipe fracture, especially on uneven or rocky terrain. Dropped pipe frequently hits one end first and then the other end slaps down, multiplying or even repeating the impact.

Low temperature hydraulic fluids or motor oils may be required, and equipment may need to be warmed before use. Gasoline or diesel powered portable generators must be operated outside of any protective enclosure.

## **Temperatures around 90°F (32°C) and above**

A shade canopy above fusing operations is recommended to prevent excessive sunlight heating. Gloves are recommended for equipment and pipe handling.

## **Temperatures from about 55°F to 90°F (13°C to 32°C)**

No special precautions for temperature are necessary. If conditions are sunny, black pipe can be much hotter than ambient temperatures. Gloves are recommended for pipe handling.

## **Temperatures from about 32°F to 55°F (0°C to 13°C) and below 32°F (0°C)**

During the heating cycle, an initial pressure is required to assure that the pipe ends are in full contact against the heating plate. When a slight initial melt bead is visible the around entire circumference of both pipe ends, reduce heating pressure to zero for the heat soak cycle.

In colder conditions, the initial melt bead will take longer to develop completely around the pipe ends because the pipe is at a lower temperature.

**NEVER INCREASE PRESSURE** during initial pressure heating to compensate for colder pipe temperature. Allow longer time for the initial bead to develop.

In colder conditions, it will take longer for the melt bead to develop and expand to the correct size because the pipe is at a lower temperature. The heating plate surface temperature must be within the specified range of 400 to 450°F (204 to 232°C) regardless of ambient temperature or pipe temperature.

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NEVER INCREASE HEATING PLATE SURFACE TEMPERATURE. Allow longer time for the melt bead to develop.

## Temperatures around 32°F (0°C) and lower

Fusing operations should be conducted within a full enclosure shelter. For temperatures around -4°F (-20°C) and below, a full enclosure shelter with auxiliary heating should be provided. Pipe ends should be pre-heated using a heating blanket or warm air devices to elevate the pipe temperature. Warming devices should not exceed 120°F (49°C). Heating blankets should be wrapped completely around the pipe end for even heating. Warm air heating devices should be positioned to evenly heat the full circumference of the pipe end. An alternate method of pre-heating is to clamp the pipe ends in the butt fusion machine, install the heating plate, position the pipe ends within ¼ to ½ inch (6 to 12 mm) of the heater plate face, and allow the pipe ends to preheat for 30 to 120 seconds. Larger diameter and greater wall thickness should receive the longer preheating time.

Preheating PE pipe by direct open flame is prohibited due to the lack of adequate heating control, the likelihood of oxidative damage to the pipe ends, and possible pipe ignition.

## General Considerations for Weather, Wind and Temperature

PE pipe and fittings will expand and contract with changes in temperature. If butt fusion machine pipe clamp closure is limited, shims of elastomeric material may be necessary to secure very cold pipe against slippage. In four-clamp machines, shims should be used only in the outer clamps.

Side shelters or curtains may be required on windy, warm days to guard against wind chill effects.

Where pipe ends are to be clamped in the fusion machine, pipe OD surfaces must be clean, dry and free from ice, snow, frost, water, dirt and other contamination.

Pipe ID surfaces within 12 inches (300 mm) of the pipe end must be clean, dry and free from ice, snow, frost, water, dirt and other contamination.

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