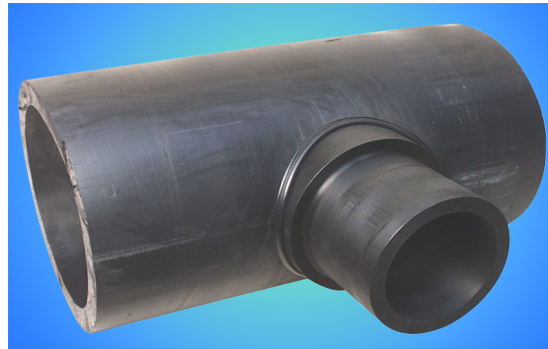
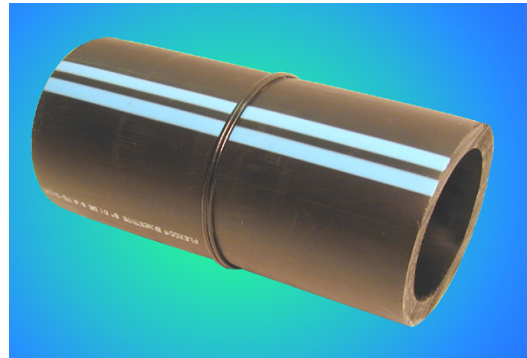
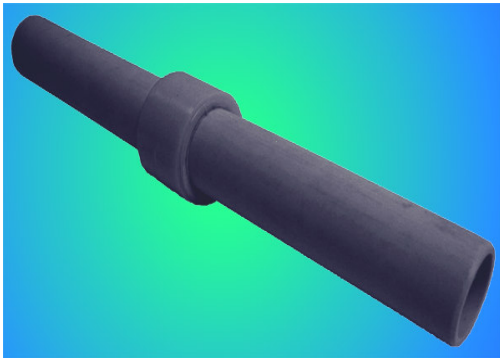


Charter Plastics

Polyethylene. Pipe. Partners.



Socket, Butt and Sidewall Fusion Procedures Manual



Heat Fusion Joining Procedures

Polyethylene pipe classifications

SIDR/ IDR - (Standard Inside Dimension Ratio) ASTM D 2239 - Inside Diameter Controlled:

This pipe is sized based on inside diameter. Pipe designed to be joined via heat fusion, is sized based on the pipe's outside diameter. This pipe should be joined with insert fittings and clamps or with special O.D. (outside diameter) mechanical fittings designed to meet ASTM D2239 sizing standards.

CTS (Copper Tube Size) ASTM D2737, ASTM D2513 - Outside Diameter Controlled:

The preferred method for joining this pipe is heat fusion. O.D. (outside diameter) controlled mechanical fittings may also be used.

IPS (Iron Pipe Size) ASTM D 3035, ASTM F714 & ASTM D2513 - Outside Diameter Controlled:

The preferred method for joining this pipe is with heat fusion. O.D. (outside diameter) controlled mechanical fittings for ASTM D3035 pipe may also be used.

DIPS (Ductile Iron Pipe Size) ASTM F714 - Outside Diameter Controlled:

The preferred method for joining this pipe is with heat fusion. O.D. (outside diameter) controlled mechanical fittings may also be used.

Overview of Heat Fusion

In heat fusion, the surfaces are prepared, simultaneously melted with a fusion iron, the melted surfaces are brought together and held under pressure. As the molten materials cool, they mix and fuse into a permanent fusion joint. Charter Plastics fusion procedures require specific tools and equipment for the fusion type and for the sizes of pipe and fittings being joined.

The three types of heat fusion discussed in this manual include:

- Socket fusion - used to join 3" IPS and smaller tubing and pipe to socket fittings.
- Butt fusion - used to join plain end pipes and fittings that have the same outside diameter and a similar wall thickness (within one SDR).
- Saddle (sidewall) fusion - used to install branch outlets, tapping tees, branch saddles and service saddles to a main.

Key Points of Quality Fusions:

- Fusion equipment and tools must be properly sized and in good working order.
- Insure the fusion tool surface is clean, undamaged and operating at the proper fusion temperature.
- The fusion operator must be knowledgeable in the use and operation of fusion equipment and procedures.
- Proper care must be taken to clean and prepare the surfaces of both pipe and fittings.
- Fusion procedures provided are intended for use as guidelines. Acceptable fusion joints depend on visual verification, fusion experience and quality heating tools.
- Ambient conditions such as wind, rain and temperature should be considered, and if necessary, compensated for during field fusions.
- Check the power supply to your fusion iron to verify proper voltage and amperage.
- Always conduct test fusions before you begin installations. Random test fusions are also recommended if you are fusing pipe for an extended period of time to insure continued validity of the joints.

Charter Plastics Socket Fusion Procedures ½” – 3”

General Information:

- a. The installer should be certified in socket fusion by the pipe manufacturer or other authorized source.
- b. Refer to the pipe manufacturers recommendations for fusing pipe.
- c. Verify that the pipe size:
IPS made to ASTM D3035 or ASTM D2513 standards
CTS made to ASTM D2737 or ASTM D2513 standards
- d. Charter Plastics recommends that you have someone assist you when performing socket fusion in the field.
- e. The procedures provided are intended for use as guidelines. Acceptable fusion joints depend on visual verification, fusion experience and quality heating tools.
- f. Ambient conditions such as wind, rain and temperature should be considered, and if necessary, compensated for during field fusions.
- g. Check the power supply to your fusion iron to verify proper voltage and amperage.
- h. Always conduct test fusions before you begin installations. Random test fusions are also recommended if you are fusing pipe for an extended period of time to insure continued validity of the joints.
- i. If a fusion joint is in question, cut the joint off, discard the fitting and start over.

Equipment Needed For Socket Fusion:

Pipe Cutters
Heating Tools
Socket Faces
Cold Ring
Depth Gauge/Chamfer Tool
Timing Device (stopwatch or watch with a second hand)
(2) Temperature-Indicating Crayons:
For PE 2406/2708 pipe : 500° and 525° F (260° and 274° C)
For PE 3408/3608 pipe : 500° and 525° F (260° and 274° C)
For PE 4710 pipe : 450° and 475° F (232° and 246° C)
Emery Clothe 320 or 240 grit
Clean Lint-Free Cloth

Socket Fusion Procedures:

1. Verify that the socket faces, cold ring and depth gauge/chamfer tool are compatible with the pipe size.
2. Make sure socket faces are clean and free from any contaminants. Securely attach them to the heating iron.
3. Preheat fusion iron to the appropriate temperature for the pipe being fused.
 - For PE 2406/2708 pipe: 500° to 525° F (260° to 274° C)
 - For PE 3408/3608 pipe: 500° to 525° F (260° to 274° C)
 - For PE 4710 pipe : 450° to 475° F (232° to 246° C)
4. Check heating tool for proper temperature. Most irons have a temperature gauges but Charter recommends verification with the temperature crayons or other measuring device. Make necessary adjustments.
5. Trim the pipe ends squarely with pipe cutter or saw. If a saw is used, de-burr the inside of the pipe.
6. Place the chamfer tool on the pipe and rotate to remove approximately 1/16" (1-2 mm) from the outer edge of the pipe.
7. Lightly rough the chamfered end of the pipe with an emery cloth. Extend this light roughing of the pipe for a length approximate to the depth of the socket joint.
8. Lightly rough the inside of the socket fusion fitting with an emery cloth to remove residual mold release or oils,
9. Wipe off the pipe and fitting with a clean, dry, lint free cloth. Avoid touching the cleaned surface with your hands. Dirt or oils can contaminate the fusion joint.
10. To measure for proper socket insertion, place depth gauge over chamfered end of the pipe. Place the cold ring on the pipe so that it touches the edge of the depth gauge. Secure the cold ring and remove the depth gauge.
11. Place your socket fusion fitting on the face of heating tool. Apply a firm, steady pressure allowing the fitting to melt approximately 2/3 of the way onto the heating tool. **Do not force or twist the fitting. (Twisting the fitting may push the molten plastic away from the fusion area.)**
12. When the fitting is 2/3 of the way on the heating tool, grasp the pipe and insert it into the heating tool. Push the pipe and fitting into the heating tool together with steady, even pressure. **Do not twist.**
13. The heating cycle begins when the edge of the fitting is against the heating tool and when the heating tool is against the cold ring. Always use a timing device to monitor the heat cycle. Heat cycle times will vary with the size of the pipe you are fusing and with ambient conditions. Refer to table # 1 for recommended heat cycle times.
14. When heat cycle time has elapsed, pull the fitting off the heating tool with a quick snap. **Do not twist.** Remove the pipe from the heating iron with another quick snap.
15. Quickly inspect the melt pattern to insure both surfaces have been melted. If the melt is incomplete, cut off the end of the pipe, get a new fitting and start over. Never attempt to re-melt the pipe or fitting.
16. **Within three seconds** after the heating tool has been removed, firmly push the melted fitting squarely onto the pipe end until it touches the cold ring clamp. **Do not twist!**
17. Continue to hold the fitting in place for the duration of the hold time. Refer to table # 1 for hold time recommendations.
18. Check the joint for proper alignment and for a complete melt pattern. If the quality of the joint is questionable, remove and discard the fitting and start over.
19. **Wait ten minutes to complete cooling time before subjecting the joint to rough handling including: bending, burying, pressure testing or backfill stress.**

Table # 1

SOCKET FUSION PE 2406/2708 PIPE AND FITTINGS 500°F to 525°F (260°C to 274°C)			
PIPE SIZE	HEATING TIME SECONDS	HOLDING TIME SECONDS	COOLING TIME MINUTES
½" CTS	6	20	10
1" CTS	9	20	10
½" IPS	6	20	10
¾" IPS	8	20	10
1" IPS	10	20	10
1-1/4" IPS	12	30	10
1-1/2" IPS	14	30	10
2" IPS	16	30	10
3" IPS	20	30	10

The times shown on these charts are based on an ambient temperature of 55°-85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.

SOCKET FUSION
PE 3408/3608 PIPE AND FITTINGS
500°F to 525°F (260°C to 274°C)

PIPE SIZE	HEATING TIME SECONDS	HOLDING TIME SECONDS	COOLING TIME MINUTES
½" CTS	9	30	10
¾" CTS	12	30	10
1" CTS	14	30	10
½" IPS	9	30	10
¾" IPS	12	30	10
1" IPS	15	30	10
1-1/4" IPS	18	40	10
1-1/2" IPS	20	40	10
2" IPS	24	40	10
3" IPS	30	50	10

The times shown on these charts are based on an ambient temperature of 55°-85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.

SOCKET FUSION TIME CYCLES
PE 4710 PIPE AND FITTINGS

450°F to 475°F (232°C to 246°C)

PIPE SIZE	HEATING TIME SECONDS	HOLDING TIME SECONDS	COOLING TIME MINUTES
½" CTS	9	30	10
¾" CTS	12	30	10
1" CTS	14	30	10
½" IPS	9	30	10
¾" IPS	12	30	10
1" IPS	15	30	10
1-1/4" IPS	18	40	10
1-1/2" IPS	20	40	10
2" IPS	24	40	10
3" IPS	30	50	10

The times shown on these charts are based on an ambient temperature of 55°- 85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.

Charter Plastics Butt Fusion Procedures:

General Information:

- a. The installer should be certified in butt fusion by the pipe manufacturer or other authorized source.
- b. Refer to the pipe manufacturers recommendations for fusing pipe
- c. Verify that the pipe is:
 - IPS made to ASTM D3035, ASTM F714 or ASTM D2513 standards
 - DIPS made to ASTM F714 standards
 - CTS made to ASTM D2737 or ASTM D2513 standards
- d. The procedures provided are intended for use as guidelines. Acceptable fusion joints depend on visual verification, fusion experience and quality heating tools.
- e. Ambient conditions such as wind, rain and temperature should be considered, and if necessary, compensated for during field fusions.
- f. Check the power supply to your fusion iron to verify proper voltage and amperage.
- g. Always conduct test fusions before you begin installations. Random test fusions are also recommended if you are fusing pipe for an extended period of time to insure continued validity of the joints.
- h. If a fusion joint is in question, cut the joint off, discard the fitting and start over.

Equipment Needed For Butt Fusion:

Butt Fusion Machine
Trimming Device
Heating Iron
Butt Fusion Heater Faces
Butt Fusion Liners
Timing Device (stopwatch or watch with a second hand)
2) Temperature-Indicating Crayons:

- For PE 2406/2708 : 500° and 525° F (260° and 274° C)
- For PE 3408/3608 : 500° and 525° F (260° and 274° C)
- For PE 4710 : 450° and 475° F (232° and 246° C)

Emery Clothe 320 or 240 grit
Clean Lint-Free Cloth

Butt Fusion Procedures :

1. Verify that the butt fusion heater faces and liners are compatible with the pipe size.
2. Make sure heater face is clean and free from any scratches.

3. Preheat fusion iron to the appropriate temperature for the pipe being fused.
 - For PE 2406/2708 pipe : 500° to 525° F (260° to 274° C)
 - For PE 3408/3608 pipe : 500° to 525° F (260° to 274° C)
 - For PE 4710 pipe : 450° to 475° F (232° to 246°C)
4. Check heating tool for proper temperature. (Most irons have temperature gauges but Charter Plastics recommends verification with temperature crayons or other measuring device). The temperature measurements should be taken at various places on the heater faces. Temperatures should not vary more than:
 - 20° F (11° C) in any two places for pipe under 18-inches
 - 35° F (19° C) for pipe larger than 18-inches
5. Place pipe or pipe and fitting in butt fusion machine. Allow ends to extend past the alignment clamps 1" (25 mm) for facing purposes.
6. Wipe off ends of pipe and fitting with a clean, dry, lint-free cloth.
7. Place the trimmer between the pipe and fitting. Bring the pipe or pipe and fitting ends firmly against the cutting blade and trim a thin, continuous strip of material from both. When the trimmer stops are against both clamps, the ends should be completely faced. Pull the ends away from the cutting disc and remove the trimmer.
8. Remove shavings from the pipe and fitting being careful not to touch the newly faced ends. Dirt or oil will contaminate the joint.
9. Check alignment of the pipe and fitting by bringing the ends together and examining the O.D. (outside diameter) junction of the two ends. Gaps between the end of the pipe and fitting should not exceed 10% of the pipe wall. If there is a misalignment, tighten the clamp on the end appearing to be larger in diameter.
10. Separate and place heating tool between the ends of the pipe. Bring pipe ends in contact with the heating tool applying a firm fingertip pressure (fusion pressure on a hydraulic machine). Observe the melt bead as it develops, maintaining fingertip pressure (fusion pressure on a hydraulic machine) until the desired bead size (refer to table # 2) of molten material is visible around the entire circumference of both ends.
11. Start the heat time cycle. Relax the force but maintain steady contact of the pipe and fitting ends with the heating tool. Always use a timing device to monitor the heat cycle. The cycle times will vary with the size of pipe you are fusing and with weather conditions. Refer to table # 3.
12. When the heat cycle time has elapsed, snap the pipe away from the heating tool. Remove heating tool being careful not to remove any molten material from the fusion area. Quickly inspect the ends for even melt pattern over the entire melt area.
13. **Within three seconds** after removing heating tool, bring pipe ends together until they touch. Increase pressure slightly, applying only enough to obtain a roll back of bead onto the pipe and the fitting ends. When using a hydraulic machine Charter Plastics recommends using an interfacial pressure between 60 psi to 90 psi (414-621 kPa, 4.14-6.21 bar).
14. Do not apply excess pressure to roll back. Forcing too much of the molten material out can cause a cold joint. Maintain joining pressure by locking machine in place for duration of cooling time. Refer to table # 3 for the recommended cooling time.
15. Joint should remain in a secure position for an additional three minutes after cooling time.

16. Inspect the entire circumference of the fusion joint for uniform rollback of the melt bead. The edges of the bead should be against the pipe and fitting. A good butt fusion exhibits:
 - Proper rollback of the melt bead
 - No visible gaps or voids
 - Proper melt pressure and alignment

17. Allow pipe to cool per table # 3. Then wait a minimum of ten minutes for the fusion joint to cool before subjecting the pipe to rough handling including: bending, burying, pressure testing or backfill stress.

Table #2

Butt Fusion Melt Bead Size Table	
Pipe Size	Approximate Melt Bead Size
1-1/4" and smaller (40 mm and smaller)	1/32" - 1/16" (1 - 2 mm)
Above 1-1/4" through 3" (40 mm through 90 mm)	~1/16" (2 mm)
Above 3" through 8" (90 mm through 225 mm)	1/8" - 3/16" (3 - 5 mm)
Above 8" through 12" (225 mm through 315 mm)	3/16" - 1/4" (5 - 6 mm)
Above 12" through 24" (315 mm through 630 mm)	1/4" - 7/16" (6 - 11 mm)

Table # 3

Butt Fusion Time Cycles PE 2406/2708 Pipe and Fittings 500°F to 525°F (260°C to 274°C)				
Pipe Size	Heating Time Seconds	Holding Time Seconds	Cooling Time Minutes	Rough Handling Time
1-1/4"	13	35	3	10
1-1/2"	15	40	3	10
2"	15	40	3	10
3"	20	50	3	10
4"	20	55	4	10

The times shown on these charts are based on an ambient temperature of 55°-85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.

Butt Fusion Time Cycles PE 3408/3608 Pipe and Fittings

500°F to 525°F (260°C to 274°C)

Pipe Size	Heating Time Seconds	Holding Time Seconds	Cooling Time Minutes	Rough Handling Time
1-1/4"	18	70	3	10
1-1/2"	22	70	3	10
2"	25	70	3	10
3"	30	70	3	10
4"	35	90	4	10

The times shown on these charts are based on an ambient temperature of 55°-85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.

Butt Fusion Time Cycles PE 4710 Pipe and Fittings 450°F to 475°F (232°C to 26°C)

Pipe Size	Heating Time Seconds	Holding Time Seconds	Cooling Time Minutes	Rough Handling Time
1-1/4"	18	70	3	10
1-1/2"	22	70	3	10
2"	25	70	3	10
3"	30	70	3	10
4"	35	90	4	10

The times shown on these charts are based on an ambient temperature of 55°-85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.

Butt Fusion for Pipe Sizes > 4"

Follow butt fusion steps 1-9.

Place the heating tool between the pipe and fitting ends, and move the ends against the heating tool. The initial contact should be under moderate pressure to ensure full contact of heating tool. Hold contact pressure very briefly then release pressure without breaking contact. Hold the ends against the heating tool **without force**. A bead will begin to appear on the pipe and fitting. When the proper bead size (see table #2) is achieved, separate the ends, and remove the heating tool.

Quickly inspect the ends for even melt pattern over the entire melt area.

Within three seconds after removing the heating tool, bring pipe ends together until they touch. Increase pressure slightly applying only enough to obtain roll back of the bead onto the pipe and fitting ends. Do not apply excess pressure to roll back.

Follow butt fusion steps 14-16

Fusion joints on pipe sizes larger than 4” should cool for approximately one minute for each inch of pipe diameter.

Wait an additional 30 minutes before subjecting the pipe to rough handling including bending, burying, pressure testing or backfill stress.

Charter Plastics Recommended Sidewall Fusion Procedures:

General Information:

- a. The installer should be certified in sidewall fusion by the pipe manufacturer or other authorized source.
- b. Refer to the pipe manufacturers recommendations for fusing pipe.
- c. Verify that the pipe is:
 - IPS made to ASTM D3035, ASTM F714 or ASTM D2513 standards
 - DIPS made to ASTM F714 standards
 - CTS made to ASTM D2737 or ASTM D2513 standards
- d. The procedures provided are intended for use as guidelines. Acceptable fusion joints depend on visual verification, fusion experience and quality heating tools.
- e. Ambient conditions such as wind, rain and temperature should be considered, and if necessary, compensated for during field fusions.
- f. Check the power supply to your fusion iron to verify proper voltage and amperage.
- g. Always conduct test fusions before you begin installations. Random test fusions are also recommended if you are fusing pipe for an extended period of time to insure continued validity of the joints.
- h. If a fusion joint is in question, cut the joint off, discard the fitting and start over.

Equipment Needed

Sidewall Fusion Machine

Heating Iron

Fitting Adapters

Timing Device (stopwatch or watch with a second hand)

(2) Temperature-Indicating Crayons

For PE 2406/2708 pipe : 500° and 525° F (260° and 274° C)

For PE 3408/3608 pipe : 500° and 525° F (260° and 274° C)

For PE 4710 pipe : 450° and 475° F (232° and 246° C)

Emery Cloth 60 grit or coarser

Clean Lint-Free Cloth

Sidewall Fusion Procedures:

1. Install the fusion machine on the pipe (main). Make sure you use proper size saddle holder for the fittings to be applied since there are many types of tools available, install according to the machine manufacturers instructions.
2. Prepare the pipe surface by wiping with a clean, dry cloth. Roughen the pipe surface in the designated fusion area and on the contour of the saddle-fitting base with a 60 grit or coarser emery cloth to remove the shiny finish on the pipe. Remove all residues with a clean, dry, lint free cloth.
4. Check surfaces of heating tool to insure they are clean. Preheat fusion iron to the appropriate temperature for the pipe being fused.
 - For PE 2406/2708 pipe: 500° to 525° F (260° to 274° C)
 - For PE 3408/3608 pipe: 500° to 525° F (260° to 274° C)
 - For PE 4710 pipe : 450° to 475° F (232° to 246°C)
5. Refer to table # 4 for recommended melt pattern pressures, heat soak times, bead size and fusion pressures.

6. Position heating tool on main. Place saddle fitting against the heater faces and apply pressure evenly and squarely to establish the melt pattern.
7. During the heating cycle, maintain the recommended pressures until the proper size melt bead can be seen completely around the base of the saddle.
8. When the melt bead is established, reduce the pressure to “0” for the duration of the Heat Soak Time cycle. Reducing the pressure prevents you from pushing out too much of the molten polyethylene.
9. After completing the heat soak time, quickly remove the iron, and examine both melted surfaces. Bring fitting and main together applying the recommended fusion pressure. You will continually have to adjust the pressure to maintain the recommended psi.
10. The joint should remain in a secure position, making sure there is no stress on the joint, for an additional three minutes after holding time.

Wait ten minutes to complete cooling time before subjecting the joint to bending, burying, pressure testing, or similar rough handling or backfill stress

Do Not Tap if fusion joint is unacceptable or in question for any reason. Cut off fitting top (to avoid misuse later) and apply a new fitting to a new section of pipe.

Table # 4

Sidewall Fusion Guidelines PE 3408/3608 Pipe and Fittings 500°F to 525°F (260°C to 274°C)

Main Size	Pressure to Est. Melt Pattern on Main (psi)	Bead Size	Heat Soak Time Seconds	Fusion Pressure (psi)
3x2	140 - 160	1/8"	15 - 25	140 - 160
4x2	160 - 180	1/8"	25 - 35	160 - 180
6x2	175 - 190	1/8"	40 - 50	175 - 190
8x2	180 - 210	1/8"	45 - 60	180 - 210
10x2	180 - 210	1/8"	45 - 60	180 - 210
12x2	180 - 210	1/8"	45 - 60	180 - 210
4x3	350 - 380	1/8" - 3/16"	30 - 45	350 - 380
6x3	380 - 410	1/8" - 3/16"	45 - 60	380 - 410
8x3	410 - 450	1/8" - 3/16"	60 - 90	410 - 450
10x3	410 - 450	1/8" - 3/16"	60 - 90	410 - 450
12x3	410 - 450	1/8" - 3/16"	60 - 90	410 - 450
6x4	630 - 680	3/16" - 1/4"	60 - 90	630 - 680
8x4	680 - 730	3/16" - 1/4"	90 - 120	680 - 730
10x4	680 - 730	3/16" - 1/4"	90 - 120	680 - 730
12x4	680 - 730	3/16" - 1/4"	90 - 120	680 - 730
8x6	1450 - 1575	3/16" - 1/4"	100 - 150	1450 - 1575
10x6	1450 - 1575	3/16" - 1/4"	100 - 150	1450 - 1575
12x6	1450 - 1575	3/16" - 1/4"	100 - 150	1450 - 1575

The times shown on these charts are based on an ambient temperature of 55°- 85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.

Sidewall Fusion Guidelines

PE 4710 Pipe and Fittings 450°F to 475°F (232°C to 246°C)

Main Size	Pressure to Est. Melt Pattern on Main (psi)	Bead Size	Heat Soak Time Seconds	Fusion Pressure (psi)
3x2	140 - 160	1/8"	15 - 25	140 - 160
4x2	160 - 180	1/8"	25 - 35	160 - 180
6x2	175 - 190	1/8"	40 - 50	175 - 190
8x2	180 - 210	1/8"	45 - 60	180 - 210
10x2	180 - 210	1/8"	45 - 60	180 - 210
12x2	180 - 210	1/8"	45 - 60	180 - 210
4x3	350 - 380	1/8" - 3/16"	30 - 45	350 - 380
6x3	380 - 410	1/8" - 3/16"	45 - 60	380 - 410
8x3	410 - 450	1/8" - 3/16"	60 - 90	410 - 450
10x3	410 - 450	1/8" - 3/16"	60 - 90	410 - 450
12x3	410 - 450	1/8" - 3/16"	60 - 90	410 - 450
6x4	630 - 680	3/16" - 1/4"	60 - 90	630 - 680
8x4	680 - 730	3/16" - 1/4"	90 - 120	680 - 730
10x4	680 - 730	3/16" - 1/4"	90 - 120	680 - 730
12x4	680 - 730	3/16" - 1/4"	90 - 120	680 - 730
8x6	1450 - 1575	3/16" - 1/4"	100 - 150	1450 - 1575
10x6	1450 - 1575	3/16" - 1/4"	100 - 150	1450 - 1575
12x6	1450 - 1575	3/16" - 1/4"	100 - 150	1450 - 1575

The times shown on these charts are based on an ambient temperature of 55°- 85° F (13°-29°C) (no wind) and are guidelines only. The exact time could vary depending on environmental and equipment conditions. Test fusions are recommended to establish heat and hold times based on your conditions.