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TITLE:  INSTALLATION OF ELECTROFUSION FITTINGS ON PE PLASTIC PIPE/TUBING AND MOLDED FITTINGS USING A UNIVERSAL ELECTROFUSION PROCESSOR

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This specification has been revised to incorporate comments made by GTI's technical experts and Con Edison's subject matter experts.
# Gas Operations Standards

**TITLE:** INSTALLATION OF ELECTROFUSION FITTINGS ON PE PLASTIC PIPE/TUBING AND MOLDED FITTINGS USING A UNIVERSAL ELECTROFUSION PROCESSOR

**EFFECTIVE DATE:** September 30, 2015

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1.0 **SCOPE**

This specification describes the requirements for the installation of approved electrofusion fittings on polyethylene (PE) plastic pipe, tubing, and molded fittings using a universal electrofusion processor.

See Gas Specification G-8123, “Heat Fusion Joining of Polyethylene (PE) Plastic Pipe/Tubing and Fittings for Gas Mains and Services” for the requirements to join PE plastic pipe, tubing, and molded fittings by butt fusion and branch saddle fusion.

See Gas Specification IP-20, “Installation of Mechanical Fittings for Plastic Pipe and Tubing” for the requirements to join PE plastic pipe and tubing with mechanical fittings.

2.0 **LEGAL REQUIREMENTS**


3.0 **OPERATOR QUALIFICATION**

3.1 Installers of PE Plastic Pipe

A) Installers who tap an energized pipeline, weld steel, and join PE plastic pipe by heat fusion (butt fusion or branch saddle fusion), electrofusion, or with mechanical fittings shall be Operator Qualified.

All other “covered tasks” shall be completed by either Operator Qualified individuals or individuals under the direct observation of one who is Operator Qualified. “Direct observation” means that the Operator Qualified individual remains in direct visual and verbal contact at all times with the individual performing the task.

B) Installers who join PE plastic pipe/tubing and fittings by heat fusion (butt fusion or branch saddle fusion) shall be Operator Qualified and in compliance with the annual requalification requirements of Gas Specification G-8121, "Qualification of Installers Performing Heat Fusion or Electrofusion of Polyethylene Plastic Pipe/Tubing and Fittings for Gas Mains and Services."

All heat fusion joints must be fabricated in accordance with the fusion procedures outlined in Gas Specification G-8123.
3.0 **OPERATOR QUALIFICATION** (Continued)

C) Installers who join PE plastic pipe/tubing and fittings by electrofusion shall be Operator Qualified and in compliance with the annual requalification requirements of Gas Specification **G-8121**.

All electrofusion joints must be installed in accordance with the electrofusion procedures outlined in this specification, the *2015 Northeast Gas Association (NGA) Plastic Pipe Joining Manual*, and manufacturer’s assembly instructions included with the electrofusion fitting.

D) Installers who join PE plastic pipe/tubing with mechanical fittings, shall be Operator Qualified and in compliance with the annual requalification requirements of Gas Specification **G-8199**, “Qualification of Installers Who Join Plastic Pipe/Tubing with Mechanical Fittings.”

All mechanical joints must be installed in accordance with the installation procedures outlined in Gas Specification **IP-20**.

3.2 Peer Inspectors of PE Plastic Joints

A) Peer inspectors who inspect PE plastic pipe joints (heat fusion, electrofusion, or with mechanical fittings) shall be Operator Qualified and in compliance with the annual requalification stipulated in Gas Specifications **G-8199** and **G-8121 OR** Operator Qualified to visually inspect PE plastic joints (e.g. CCM 0003, GAS6016) and current with 3 year requalification.

B) Peer inspectors who are required to wear corrective lenses, must wear same to ensure proper inspection of PE plastic joints.

4.0 **REQUIREMENTS FOR INSTALLERS AND PEER INSPECTORS**

4.1 All installers (Company, Contractor, Per Diem) of heat fusion joints on PE plastic pipe, tubing, and molded fittings shall identify the installer by marking the plastic pipe, tubing, or fittings adjacent to the heat fusion joint at 12 o’clock (or as close to 12 o’clock as is possible) with a Company approved marker (e.g. Class/Stock # 024-7106).

A) Company installers shall clearly print their 5 digit employee number and “J” for joiner.
4.0 REQUIREMENTS FOR INSTALLERS AND PEER INSPECTORS (Continued)

B) Contractor and Per Diem installers shall clearly print their respective Learning Center Operator Qualification identification number (as noted on Con Edison Operator Qualification card) and "J" for joiner.

4.2 Following completion of the electrofusion cycle, the Operator Qualified installer and the Operator Qualified peer inspector shall visually inspect the entire area of the electrofusion fitting and compare against visually acceptable electrofusion fittings in the 2015 Northeast Gas Association (NGA) Plastic Pipe Joining Manual and the manufacturers’ recommended appearance guidelines.

A) The electrofusion fitting must closely resemble visually acceptable electrofusion fittings in the 2015 Northeast Gas Association (NGA) Plastic Pipe Joining Manual and the manufacturers’ recommended appearance guidelines. Misalignment, melt out, and exposed wire are unacceptable.

B) If there is any reason to believe the electrofusion fitting is defective, it shall be removed and replaced.

4.3 All peer inspectors (Company, Contractor, Per Diem) of electrofusion fittings on PE plastic pipe, tubing, and molded fittings shall identify the inspector by marking the plastic pipe, tubing, or fittings adjacent to the electrofusion fitting at 12 o'clock (or as close to 12 o'clock as is possible) with a Company approved marker (e.g. Class/Stock # 024-7106).

A) Company inspectors shall clearly print CE (for Con Edison), their 5 digit employee number and "P" for peer inspector.

B) Contractor and Per Diem inspectors shall clearly print their respective Learning Center Operator Qualification identification number (as noted on Con Edison Operator Qualification card) and "P" for peer inspector.

4.4 All PE plastic joints, joiners, and peer inspectors shall be documented as per GAS6006, “Documentation and Inspection of Polyethylene (PE) Plastic Joints on Gas Mains and Services.”
5.0 GENERAL GUIDELINES

5.1 The preferred methods to join PE plastic pipe and tubing are heat fusion and electrofusion. (See Gas Specification G-8123)

When heat fusion or electrofusion is not practical or available, only approved restraining-type mechanical fittings shall be installed on PE plastic pipe and tubing per Gas Specification IP-20. All steel mechanical fittings shall be cathodically protected per Gas Specification G-8209, "Field Coating of Steel Pipe and Fittings Installed Underground and in Subsurface Structures."

5.2 All approved electrofusion fittings are for use with all legacy PE plastic pipe as well as currently approved high density PE 3408/4710 plastic pipe and tubing.

See Specification G-8104, “Polyethylene Pipe, Tubing, and Fittings for Gas Mains and Services” for all approved PE plastic pipe, tubing, and fittings.

See the GasHub for manufacturer’s installation instructions and approved electrofusion processors’ operating manuals.

NOTES: M8000 pipe was all black and replaced in 1997 with Performance Pipe 8100.

Performance Pipe 6800 is black with two thick yellow stripes at three different points on the pipe’s surface.

Performance Pipe 8100 has a “yellow shell” around black pipe. This is the equivalent of Performance Pipe 8300 and JM Eagle (US Poly) UAC3700.

Performance Pipe 8300 is black with one thick yellow stripe at three different points on the pipe’s surface. This is the equivalent of Performance Pipe 8100 and JM Eagle (US Poly) UAC 3700.

JM Eagle (US Poly) UAC3700 is black with one thin yellow stripe at three different points on the pipe’s surface and the print line states PE100. This is the equivalent of Performance Pipe 8100 and 8300.

5.3 Quality fusion requires using all of the required tools and equipment, and following all of the steps in the procedure in the correct sequence. Faulty fusion is caused by improper or defective equipment, or not following the procedure (omitting steps or performing steps out of sequence).
5.0 **GENERAL GUIDELINES** (Continued)

5.4 Electrofusion fittings **must** be installed at least three (3) pipe diameters or 12", whichever is **greater**, from a squeeze-off point.

5.5 Inspect PE plastic pipe, tubing, and fittings prior to installation to verify:

- No cuts, gouges, deep scratches, or other defects.
- PE plastic material is high density polyethylene (HDPE), PE3408/4710, and manufactured per ASTM D2513.
- PE plastic material is **NOT** older than 2 years old.

(See Gas Specification G-8122, "Transportation, Handling, and Storage of Polyethylene Plastic Pipe/Tubing, and Fittings for Gas Mains and Services")

5.6 Before beginning the process to install an electrofusion fitting, ensure the pipe is clean and dry. Clean the pipe outside diameter (OD), inside diameter (ID), and ends with a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687).

If the contamination cannot be removed in this way, wash the pipe with water and a clean, lint-free, non-synthetic cloth/paper towel to remove the contamination. Then rinse the pipe with water and dry thoroughly with a clean, lint-free, non-synthetic cloth/paper towel. **Do NOT use soap water (leak detection solution) to clean the pipe.**

If the contamination still cannot be removed with water and a clean, lint-free, non-synthetic cloth/paper towel, then 96% alcohol wipes (Class/Stock # 689-3135 and 025-3724) or 99.9% liquid isopropyl alcohol (Class/Stock # 630-1246) with a clean, lint-free, non-synthetic cloth/paper towel (e.g. NS0209687) may be used to clean extremely dirty pipe or cutting oil.

Wear nitrile gloves when using alcohol wipes. Wear nitrile gloves and goggles when using the liquid isopropyl alcohol with a clean, lint-free, non-synthetic cloth/paper towel. When using liquid isopropyl alcohol, place plastic sheeting and absorbent pads underneath the fitting. The used wipes/cloth/absorbent pads shall be disposed as non-hazardous industrial waste. Liquid isopropyl alcohol shall be disposed as flammable hazardous waste. Contact EH&S Operations for guidance when disposing liquid isopropyl alcohol.
5.0 **GENERAL GUIDELINES** (Continued)

5.7 All scrap PE plastic pipe, tubing, and/or fittings that cannot be reused, shall be brought back to the workout location for proper disposal/recycling.

6.0 **ELECTROFUSION COUPLING INSTALLATION GUIDELINES**

6.1 When making the final tie-in to existing PE plastic pipe in an excavation, electrofusion coupling(s) should be used to make the final tie-in, rather than trying to butt fuse or use mechanical fittings in the excavation. Use of two (2) electrofusion couplings with a short length of plastic pipe will facilitate pipe lineup. If electrofusion fittings cannot be used due to a hazardous environment, mechanical fittings are permitted. (See Section 9.2)

6.2 Misaligned PE plastic pipe shall **not** be joined using electrofusion couplings, butt fusion, or mechanical fittings in order to prevent mechanical stress on the pipe and joint during and after the joining process. PE plastic pipe alignment in the field can be corrected prior to joining to other PE plastic, steel, or cast iron pipe in the following manner:

A) For all pipe diameters, use approved molded fittings. (See Gas Specification G-8104 for approved molded fittings)

B) For smaller diameter pipe, and where practical for larger diameters, expose sufficient pipe at the tie-in point to take advantage of PE plastic pipe flexibility. (See Gas Specifications G-8005, “General Specification for the Installation of Gas Distribution Mains” and G-8100, “General Specification for the Installation of Gas Distribution Services for plastic pipe bending radii)

6.3 Plastic molded fittings without pup lengths **can only** be joined to PE plastic pipe, tubing and other molded fittings by heat fusion or electrofusion. (See Gas Specification G-8104 for approved fittings with pup lengths of PE plastic pipe or tubing)

Mechanical fittings **cannot** be installed directly onto a plastic molded fitting without pup lengths of PE plastic pipe or tubing.
6.0 ELECTROFUSION COUPLING INSTALLATION GUIDELINES (Continued)

6.4 Heat fusion of PE plastic pipe, tubing, and fittings of different SDR shall only be performed between one change in SDR. SDR is found on the print line of the PE plastic pipe and tubing, or on the fitting label.

| SDR  | 7 | 9/9.3 | 11 | 13.5 | 15.5 |

Joining of PE plastic pipe/fitting with SDR wall thickness greater than one change in SDR shall only be done using electrofusion. Approved restraining-type mechanical couplings may only be used for joining PE plastic pipe when an electrofusion coupling is unavailable. (See Gas Specifications IP-20 and G-8209)

A) Plastic pipe in sizes 1" IPS through 8" IPS, and 12" IPS is SDR 11.

B) Prior to 1990, 4" and smaller IPS plastic pipe was SDR 9.3.

C) Medium density Aldyl-A PE plastic pipe (tan or green) shall only be joined by electrofusion.

D) In the 1970’s, thin walled 6" IPS SDR 23.5, SDR 26, and SDR 32.5 plastic pipe was installed on the low and medium pressure gas distribution systems. Do not butt fuse 6" IPS SDR 23.5, SDR 26, or SDR 32.5 PE plastic pipe.

- 6" IPS SDR 23.5 PE plastic pipe shall only be joined by either an electrofusion coupling or a mechanical restraining coupling with SDR 23.5 stiffener (color coded orange). Reduce electrofusion fusion time by 10% of the time displayed when the coupling is scanned.

- 6" IPS SDR 26 or SDR 32.5 PE plastic pipe shall only be joined by an electrofusion coupling. For SDR 26, reduce electrofusion cycle time by 15%. For SDR 32.5, reduce electrofusion fusion time by 25% fusion time of the time displayed when the coupling is scanned.

**EXCEPTION:** 6" IPS SDR 26 installed as a sleeve for Trenchless Technology may be joined by either butt fusion or an electrofusion coupling.

E) In the 2000’s, thin walled 6" IPS SDR 23 or thinner Subcoil pipe was installed on the low pressure gas distribution system and 22.5" IPS SDR 23 Subline was installed on the high pressure gas distribution system. Do not heat fuse to Subcoil or Subline PE plastic pipe.
6.0 ELECTROFUSION COUPLING INSTALLATION GUIDELINES (Continued)

6.5 The following installation guidelines detail the steps necessary to install an electrofusion coupling using a universal electrofusion processor and inspect the completed joint.

For detailed instructions on installing electrofusion couplings, refer to the manufacturer’s assembly instructions included with the fitting and the 2015 Northeast Gas Association (NGA) Plastic Pipe Joining Manual.

For detailed instructions on using the universal electrofusion processor, refer to the manufacturer’s operating manual. (See Section 9.1)

A) Inspect PE plastic pipe, tubing, and fittings for cuts, gouges, deep scratches or other defects prior to installation of electrofusion fittings. (See Gas Specification G-8122)

B) Keep electrofusion coupling in the plastic bag provided until needed to avoid accidental contamination.

Visually inspect the inside of the coupling for defects and then check the coupling for electrical continuity (e.g. fluke meter). If any defects are noted, or if there is no electrical continuity, the electrofusion coupling shall not be installed.

C) Cut the pipe ends to ensure a square, even surface. Remove any burrs or shavings with a clean knife.

D) Check pipe for out-of-round. Use a re-rounding clamp or other device to bring the pipe back to round.

E) Clean pipe ends and surface area to be scraped by removing dirt, mud, and other debris with clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687). (See Section 5.6)

F) Measure and mark the pipe insertion depth (half the length of the coupling). Marks should be approximately 1” outside the footprint of the fitting. Use only a Company approved marker (e.g. Class/Stock # 024-7106). Do not use keel or a lumber crayon to mark the PE plastic pipe.
6.0 ELECTROFUSION COUPLING INSTALLATION GUIDELINES (Continued)

G) Scrape the marked area on the outside of the pipe to remove surface oxidation using an approved scraping tool (e.g. universal scraper, spring loaded scraper, and half-moon scraper). Do not use a file or sandpaper.

Chamfer the pipe ends and bevel the outer edge more than the inner edge.

H) Remove any debris from the inside of the pipe with a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687)

I) Clean the scraped area of the pipe and the inside of the fitting with either 96% alcohol wipes (Class/Stock #689-3135 and 025-3724) or a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687) with 99.9% liquid isopropyl alcohol (Class/Stock #630-1246). Make sure pipe and fitting surfaces are completely dry before assembly.

(See Section 5.6 for EH&S requirements for protective gloves and alcohol disposal requirements)

Never clean electrofusion molded fittings with leak detection solution.

J) Remark the stab depth, if required, by measuring half the length of the coupling and remark each pipe end.

K) If the electrofusion fitting or the surface of the scraped pipe becomes contaminated with dirt, debris, water, finger marks or other foreign substances, clean again with either 96% alcohol wipes (Class/Stock #689-3135 and 025-3724) or a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687) with 99.9% liquid isopropyl alcohol (Class/Stock #630-1246). Make sure pipe and fitting surfaces are completely dry before assembly.

(See Section 5.6 for EH&S requirements for protective gloves and alcohol disposal requirements)

L) Install the coupling to the marked insertion depth on pipe. PE plastic pipe and coupling should be kept clean, supported, and free of any external stresses.
6.0 **ELECTROFUSION COUPLING INSTALLATION GUIDELINES** (Continued)

If there is excessive resistance while sliding the coupling onto the pipe, use a re-rounding clamp or other device to bring the pipe back to round. Clean pipe as needed after removing the re-rounding clamp.

M) Insert the plastic pipe into the opposite end of the coupling. Check both measurement marks for the proper stab depth when this is completed.

**NOTE:** If it is difficult to install the two pipe ends into the electrofusion coupling because of lack of movement that occurs with short pieces or larger pipe sizes, it may be necessary to slide one coupling completely onto one of the pipe ends, bring the two pipes together, then slide the coupling from the fully stabbed pipe back to the other until the proper insertion depth is reached on both pipes. For additional details on this technique, see Section 8.0.

N) While maintaining the marked stab depth, keep the pipe secured from movement and the coupling supported during both the fusion and cooling cycles. Cooling time is noted as “CT” on the fitting label.

O) Connect the universal electrofusion processor to an adequate AC power source. If using a generator, turn the generator on and allow it to run for 30 seconds before connecting the universal electrofusion processor. Turn on the universal electrofusion processor.

P) Connect fusion plugs to the contact pins on the fitting.

**NOTE:** Couplings 12” and larger are bi-filament and each side of the coupling must be fused independently.
6.0 ELECTROFUSION COUPLING INSTALLATION GUIDELINES (Continued)

16” electrofusion couplings require pre-heating each side of the coupling prior to the fusion cycle.

Seal the annular gap between the 16” coupling and the pipe with tape. If installing the coupling one side at a time, the annular gap can be sealed with tape or by securing the plastic bag around the coupling and the pipe. Connect the fusion plugs to the contact pins on the coupling and scan the pre-heating (yellow) barcode. On completion of the pre-heating cycle, allow 10 minutes to warm through. If annular gap is still not sealed, scan the pre-heating (yellow) barcode again. On completion of additional pre-heating cycle, allow 10 minutes to warm through.

Start the fusion process by scanning the coupling (white) barcode. Repeat the pre-heating and fusion process on the other side of the coupling.

Q) Following the applicable universal electrofusion processor’s operating manual, scan the fitting barcode (verify the fitting information), and begin the fusion process. (See Section 6.4 for electrofusion to different SDR PE plastic pipe)

R) Keep the pipe secured from movement and the coupling supported during both the fusion and cooling cycles. Do not handle, pressure test, or backfill the coupling until completion of the cooling cycle(s). Cooling time is noted as CT on the fitting label.

S) Following completion of the fusion cycle, the entire area of the electrofusion joint shall be visually inspected by the Operator Qualified installer and by an Operator Qualified peer inspector. (See Section 4.2)

T) Mark the designated installer and peer inspector identification next to the coupling. (See Sections 4.1 and 4.3)
7.0 PE PLASTIC PIPE REPAIR GUIDELINES

7.1 Damaged PE pipe, sizes 3” to 16” IPS, may be repaired by an electrofusion repair patch installed by the Development Lab. Repair patches may be installed on live low pressure PE pipe that is damaged. Damaged elevated pressure (intermediate, medium, and high pressure) PE plastic pipe must have the flow of gas stopped prior to installation of the repair patch. (See Gas Specification G-8178, “Shut-Off of Polyethylene Plastic Pipe/Tubing Used for Gas Mains and Services)

7.2 Damaged PE plastic pipe, sizes 1/2” CTS to 16” IPS, may be repaired by cutting out the damaged section of PE plastic pipe and installing a replacement piece of pipe with two electrofusion couplings.

7.3 The following installation guideline details the steps necessary to cut-out and replace a damaged section of PE plastic pipe with two electrofusion couplings using a universal electrofusion processor and to inspect the completed joints.

Electrofusion control units are not intrinsically safe and must not be used until the gas flow has been stopped.

For detailed instructions on installing electrofusion couplings, refer to the 2015 Northeast Gas Association (NGA) Plastic Pipe Joining Manual and the manufacturer’s assembly instructions included with the fitting. For detailed instructions on using the universal electrofusion processor, refer to the manufacturer’s operating manual. (See Section 9.1)

A) For damaged PE plastic gas mains, safely stop off and control the flow of gas by operating an isolation valve or stop off using the approved methods in Gas Specification G-8178.

B) For damaged PE plastic gas services, safely stop-off and control the flow of gas by operating an isolation valve or stop-off using the approved methods in Gas Specification G-8178. If feasible, replace the entire section of damaged service pipe (e.g., main to valve, valve to building).

C) Cut-out and remove the damaged section of pipe per Gas Specifications IP-40, “Cut-Outs and Tie-Ins of Existing Plastic or Plastic / Metallic Gas Mains” and IP-9, “Requirements for Written Procedures and Contingency Plans.” Be sure the pipe ends on the pipe are square and evenly cut. Remove any burrs or shavings from the pipe ends that may have developed during the cutting process.
7.0 **PE PLASTIC PIPE REPAIR GUIDELINES** (Continued)

D) Measure the repair section of pipe to fit within 1/16 of the open section length.

For PE plastic gas main replacement, use pretested pipe or pressure test the replacement piece prior to installation. (See Gas Specification G-8204, “Pressure Testing Requirements For New and Replacement Gas Mains and Services”)

E) Clean the pipe ends inside and out with a dry, clean lint-free cloth to remove all dirt and contaminants.

F) **Measure and mark the pipe insertion depth on the existing pipe and the repair segment**  
Marks should be approximately 1” outside the footprint of the fitting. Mark half the length of the coupling on the existing pipe ends and a full coupling length on both ends of the repair segment.

G) **Follow the scraping procedure** in Section 7.5(G) for the existing pipe ends, and the ends of the repair segment.

H) Once scraping is completed, use a clean knife to remove any burrs. Remove any debris from the inside of the pipe with a dry, clean lint-free cloth.

I) Clean the scraped area of the pipe and the inside of the fitting with either 96% alcohol wipes (Class/Stock #689-3135 and 025-3724) or a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687) with 99.9% liquid isopropyl alcohol (Class/Stock #630-1246). Make sure pipe and fitting surfaces are completely dry before assembly.

(See Section 5.6 for EH&S requirements for protective gloves and alcohol disposal requirements)

J) **Remark the stab depths** if needed at both tie-in points on the existing pipe, and the repair segment.
7.0 PE PLASTIC PIPE REPAIR GUIDELINES (Continued)

K) Keep electrofusion coupling in the plastic bag provided until needed to avoid accidental contamination.

Visually inspect the inside of the coupling for defects and then check the coupling for electrical continuity (e.g. fluke meter). If any defects are noted, or if there is no electrical continuity, the electrofusion coupling shall not be installed.

If the electrofusion coupling(s) or the surface of the scraped pipe becomes contaminated with dirt, debris, water, finger marks or other foreign substances, clean with either 96% alcohol wipes (Class/Stock #689-3135 and 025-3724) or a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687) with 99.9% liquid isopropyl alcohol (Class/Stock #630-1246) Make sure pipe and fitting surfaces are completely dry before assembly.

(See Section 5.6 for EH&S requirements for protective gloves and alcohol disposal requirements)

L) For most gas main repairs, remove the center stops in both couplings. Slide each coupling onto the repair segment for the full length of the coupling. Place the repair segment between the two pipe ends, and slide both electrofusion EF couplings onto the existing pipe to the correct insertion depth.

For most service repairs where sufficient material is exposed, there is enough flexibility in the pipe/tubing to install electrofusion couplings without removing center stops.
If there is excessive resistance while sliding either coupling onto the pipe, use a re-rounding clamp or other device to bring the pipe back to round. Clean pipe as needed after removing the re-rounding clamp.

M) Connect the universal electrofusion processor to an adequate AC power source. If using a generator, turn the generator on and allow it to run for 30 seconds before connecting the universal electrofusion processor. Turn on the universal electrofusion processor.

N) Connect fusion plugs to the contact pins on the first coupling.

**NOTE:** Couplings 12” and larger are bi-filament and each side of the coupling must be fused independently.
7.0 **PE PLASTIC PIPE REPAIR GUIDELINES** (Continued)

O) Following the applicable universal electrofusion processor’s operating manual, scan the fitting barcode (verify the fitting information) and begin the fusion process for each coupling. (See Section 7.4 for electrofusion to different SDR PE plastic pipe)

Keep the pipe secured from movement and the coupling supported during both the fusion and cooling cycles. Do not handle, pressure test, or backfill the coupling until completion of the cooling cycle(s). Cooling time is noted as “CT” on fitting label.

P) Following completion of the fusion cycle, the entire area of the electrofusion joint shall be visually inspected by the Operator Qualified installer and by an Operator Qualified inspector. (See Section 4.2)

Q) Following completion of the cooling cycle, the repaired PE plastic gas service replacement shall be pressure tested from the point of disconnect to the service head valve. (See Gas Specification G-8204)

R) Mark the designated installer and peer inspector identification next to the coupling. (See Sections 4.1 and 4.3)

S) For repaired PE plastic gas main replacement, all tie-in joints/welds shall be soap tested for leakage with leak detecting solution only after the line has been gassed-in and the line pressure has been achieved. (See Gas Specification G-8204)

8.0 **ELECTROFUSION TAPPING TEE AND SPA SADDLE INSTALLATION GUIDELINES**

8.1 The following installation guideline details the steps necessary to install an electrofusion tapping tee or a SPA saddle (up to 8”) on a PE plastic gas main using a universal electrofusion processor and to inspect the completed joints.

For detailed instructions on installing electrofusion tapping tees and SPA saddles, refer to the 2015 Northeast Gas Association (NGA) Plastic Pipe Joining Manual, and the manufacturer’s assembly instructions included with the fitting. For detailed instructions on using the universal electrofusion processor, refer to the manufacturer’s operating manual. (See Section 9.1)
8.0 ELECTROFUSION TAPPING TEE AND SPA SADDLE INSTALLATION GUIDELINES (Continued)

A) Inspect PE plastic pipe, tubing, and fittings for cuts, gouges, deep scratches or other defects prior to installation of electrofusion fittings. (See Gas Specification G-8122)

B) **Clean the pipe** with a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687) to remove any dirt, mud, or other debris. (See Section 5.6)

C) Keep electrofusion tapping tee/SPA saddle in the plastic bag provided until needed to avoid accidental contamination.

Visually inspect the bottom of the tapping tee/SPA saddle for defects and then check the tapping tee/SPA saddle for electrical continuity (e.g. fluke meter). If any defects are noted, or if there is no electrical continuity, the electrofusion fitting shall not be installed.

D) Center the tapping tee/SPA saddle on the pipe and mark the surface area covered by the base of the tee on the PE plastic pipe. Marks should be approximately 1” outside the footprint of the fitting. Use only a Company approved marker (e.g. Class/Stock # 024-7106). Do not use keel or a lumber crayon to mark the PE plastic pipe.

E) **Check pipe for out-of-round.** Use a re-rounding clamp or other device to bring the pipe back to round.

F) **Scrape the marked area on the outside of the pipe to remove surface oxidation** using an approved scraping tool (e.g. universal scraper, spring loaded scraper, and half-moon scraper). **Do not** use a file or sandpaper.

G) Clean the scraped area of the pipe and the inside of the fitting with either 96% alcohol wipes (Class/Stock #689-3135 and 025-3724) or a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687) and 99.9% liquid isopropyl alcohol (Class/Stock #630-1246). Make sure pipe and fitting surfaces are completely dry before assembly.

(See Section 5.6 for EH&S requirements for protective gloves and alcohol disposal requirements)
8.0 ELECTROFUSION TAPPING TEE AND SPA SADDLE INSTALLATION GUIDELINES

(Continued)

H) Remove the tee/SPA saddle from the bag, visually inspect for dirt or contaminants, and center the tapping tee on the freshly scraped pipe surface.

If the electrofusion fitting or the surface of the scraped pipe becomes contaminated with dirt, debris, water, finger marks or other foreign substances, clean with either 96% alcohol wipes (Class/Stock #689-3135 and 025-3724) or a clean, dry, lint-free non-synthetic (e.g. cotton) cloth or paper towel (e.g. NS0209687) with 99.9% liquid isopropyl alcohol (Class/Stock #630-1246) Make sure pipe and fitting surfaces are completely dry before assembly.

(See Section 5.6 for EH&S requirements for protective gloves and alcohol disposal requirements)

1. For Central Plastics tapping tees, a removable saddle clamp must be placed under the pipe adjacent to the tapping tee prior to fusing. Slide the saddle clamp onto the edges of the tapping tee until the saddle clamp is squarely aligned beneath the tee. Tighten the saddle clamp to secure the tee to the plastic pipe.

2. For IPEX/Friatec tapping tees and SPA saddles, release the pre-assembled screws on one side of the tee. Using the side of the tapping tee that is still bolted together as a hinge, open the upper and lower sections of the tapping tee. Place the tapping tee onto the scraped and cleaned area of the PE plastic pipe. Evenly tighten all four screws to the stops. The bottom section of the tapping tee will remain on as a permanent component of the tee.

I) Connect the universal electrofusion processor to an adequate AC power source. If using a generator, turn the generator on and allow it to run for 30 seconds before connecting the universal electrofusion processor. Turn on the universal electrofusion processor.

J) Connect fusion plugs to the contact pins on the tapping tee.

K) Following the applicable universal electrofusion processor’s operating manual, scan the fitting barcode (verify the fitting information) and begin the fusion process for the tapping tee. (See Section 7.4 for electrofusion to different SDR PE plastic pipe)
8.0 ELECTROFUSION TAPPING TEE AND SPA SADDLE INSTALLATION GUIDELINES
(Continued)

L) Keep the pipe secured from movement during both the fusion and cooling cycles. Do not handle, pressure test, tap, or backfill the tapping tee until completion of the cooling cycle. Cooling time is noted as CT on the fitting label.

1. For Central Plastics tapping tees, keep the saddle clamp in place until completion of the cooling time(s). When the tapping operation is to be performed, the saddle clamp must be reinstalled.

M) Following completion of the fusion cycle, the entire area of the electrofusion joint shall be visually inspected by the Operator Qualified installer and by an Operator Qualified inspector. (See Section 4.2)

N) Mark the designated installer and peer inspector identification next to the coupling. (See Sections 4.1 and 4.3)

9.0 ELECTROFUSION EQUIPMENT

9.1 The following universal electrofusion processors are approved for use:

- EF Technologies - Phoenix Electrofusion Processor
- Georg Fischer Central Plastics – Easy Fuse Electrofusion Processor
- Georg Fischer Central Plastics – Emie Electrofusion Processor
- Georg Fischer Central Plastics – MSA 340 Polyvalent Electrofusion Processor
- IPEX - Friamat 1 and 2 Electrofusion Processor
- IPEX - Genesis F3 Electrofusion Processor

The operating manuals are located in the GasHub.

9.2 Electrofusion processor units are not intrinsically safe and shall not be used in a hazardous environment.

9.3 Due to the high amperage draw of electrofusion fittings, the electrical source should not be loaded down by other equipment when an electrofusion is being performed and the use of an extension cord is not encouraged. In the event an extension cord is needed, the following is recommended:
9.0 **ELECTROFUSION EQUIPMENT** (Continued)

<table>
<thead>
<tr>
<th>Cord Length</th>
<th>Wire Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 25 ft.</td>
<td># 12/3</td>
</tr>
<tr>
<td>25 ft.</td>
<td># 10/3</td>
</tr>
<tr>
<td>50 ft.</td>
<td># 8/3</td>
</tr>
<tr>
<td>100 ft</td>
<td>DO NOT USE</td>
</tr>
</tbody>
</table>

**NOTE:** Extension cords should not be used for electrofusion 16” couplings.

9.4 The following are requirements and precautions regarding the electrical equipment required to perform electrofusion:

<table>
<thead>
<tr>
<th>Fitting</th>
<th>Fitting Size</th>
<th>AC Power</th>
<th>AMPS</th>
<th>Minimum Generator Wattage</th>
<th>Minimum Allowable Generator Output Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Plastics</td>
<td>1/2&quot; CTS to 8&quot; IPS</td>
<td>110V</td>
<td>20</td>
<td>3,500</td>
<td>90 VAC</td>
</tr>
<tr>
<td>Friatec</td>
<td>2&quot; to 6&quot; IPS</td>
<td>110V</td>
<td>20</td>
<td>3,500</td>
<td>90 VAC</td>
</tr>
<tr>
<td>Friatec</td>
<td>8&quot; IPS to 20&quot; IPS</td>
<td>110V</td>
<td>30</td>
<td>4,500</td>
<td>95-135 VAC</td>
</tr>
</tbody>
</table>

10.0 **ELECTROFUSION DURING COLD AND/OR INCLEMENT WEATHER**

10.1 Extreme weather conditions may affect the quality of the electrofusion joint. The recommended ambient temperature range is as follows:

<table>
<thead>
<tr>
<th>TEMPERATURE RANGE</th>
<th>FITTINGS</th>
<th>ELECTROFUSION PROCESSOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10°F to 120°F</td>
<td>Central Plastics</td>
<td>MSA 340</td>
</tr>
<tr>
<td></td>
<td>Frialen</td>
<td>Genesis</td>
</tr>
<tr>
<td>-4°F to 122°F</td>
<td>-</td>
<td>Frialam</td>
</tr>
<tr>
<td>0°F to 120°F</td>
<td>-</td>
<td>Phoenix</td>
</tr>
</tbody>
</table>

10.2 **Temperatures below 40°F**

A) Pipe and fittings should be about the same temperature when they are electrofused.

10.3 **During inclement weather (rain or snow)**

A) Protect universal electrofusion processor and leads from the rain or snow.
10.0 ELECTROFUSION DURING COLD AND/OR INCLEMENT WEATHER

B) The pipe must clean and dry before, during, and after electrofusion.

C) Approved fire resistant tents (Class/ Stock # 689-3929, 10’ x 8’ or Class/ Stock # 659-3945, 6’ x 6’) shall only be used to protect the PE pipe at the point of joining during inclement weather and shall not be used when there is escaping gas.

If gas is escaping, it must be allowed to rise and vent unobstructed. If a connection is needed and the cause of the escaping gas can’t be repaired in a timely manner, then making the joint with a mechanical fittings should be considered.

11.0 REFERENCES

G-8005 General Specification for Installation of Gas Distribution Mains
G-8100 General Specification for Installation of Gas Distribution Services
G-8104 PE Pipe, Tubing, and Fittings for Gas Main and Services
G-8121 Qualification of Installers Performing Heat Fusion or Electrofusion of Polyethylene (PE) Plastic Pipe/Tubing for Gas Mains And Services
G-8122 Inspection, Handling, Storage, and Transportation of Polyethylene (PE) Plastic Pipe, Tubing, and Fittings for Gas Mains And Services
G-8123 Heat Fusion Joining Of Polyethylene (PE) Plastic Pipe and Fittings for Gas Mains and Services
G-8149 Responsibility for Maintenance and Replacement of Gas Services
G-8178 Shut-Off of Polyethylene Plastic Pipe/Tubing Used for Gas Mains and Services
G-8199 Qualification Procedure for Personnel Who Join Plastic Pipe/Tubing with Mechanical Fittings
G-8204 Pressure Testing Requirements for New and Replacement Gas Mains and Services
11.0 **REFERENCES** (Continued)

- **G-8209**  
  Field Coating of Steel Pipe and Fittings Installed Underground and in Subsurface Structures

- **IP-9**  
  Requirements for Written Procedures and Contingency Plans

- **IP-20**  
  Installation of Mechanical Fittings for Plastic Pipe and Tubing

- **IP-40**  
  Cut Outs and Tie-Ins of Existing Plastic or Plastic/Metallic Gas Mains

- **DOJT GAS6006**  
  Documentation and Inspection of Polyethylene (PE) Plastic Joints on Gas Mains and Services

- **HOT GAS6015**  
  Procedure for Pressure Testing and Tapping Using the Spa Saddle Tapping Tool

- **2015 Northeast Gas Association (NGA) Plastic Pipe Joining Manual**