

# **FUSION QUALIFICATION REQUIREMENTS FOR POLYETHYLENE NATURAL GAS DISTRIBUTION PRESSURE PIPES AND FITTINGS**

**TN-73**

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# FOREWORD

This technical note was developed and published with the technical help and financial support of the members of the Plastics Pipe Institute (PPI). These members have shown their commitment to developing and improving quality products by assisting standards development organizations in the development of standards, and also by developing design aids and reports to help engineers, code officials, specifying groups, contractors and users.

The purpose of this document is to establish a standardized minimum testing protocol for demonstrating the fusion compatibility of a stress-rated PE compounds and is applicable to resin and pipe/fitting manufacturers. The protocol is based on the extensive work to demonstrate the fusion compatibility of stress-rated compounds detailed in PPI TR-33. This document establishes a common protocol to facilitate data acceptance by the gas distribution industry utilizing fused PE pipe.

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The Plastics Pipe Institute, Inc.

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# FUSION QUALIFICATION REQUIREMENTS FOR POLYETHYLENE NATURAL GAS DISTRIBUTION PRESSURE PIPES AND FITTINGS

## 1.0 Introduction, Purpose and Scope

This document provides PPI's protocol for testing to demonstrate the fusion capabilities of natural gas distribution pressure pipe and fittings made from stress-rated PE compounds (see Note 1) when using fusion procedures that conform to ASTM F2620<sup>i</sup> or F3565<sup>ii</sup>.

This protocol is limited to fusion procedures conforming to the Socket Fusion, Butt Fusion, or Saddle Fusion sections of ASTM F2620. For electrofusion fittings, this protocol is limited to fusion procedures conforming to ASTM F3565 and relies upon ASTM F1055<sup>iii</sup> as the basis to verify their fusion compatibility. The testing requirements of the protocol are based on Code<sup>iv</sup> requirements for fusion procedure qualification modified per best practices as determined by PPI members. References are made herein to natural gas distribution requirements (e.g., 49CFR192<sup>iv</sup> and ASTM D2513<sup>v</sup>). Code requirements are shown in Appendix A.

**Note 1: Wherever reference is made to a PE compound in this document reference is being made to stress-rated PE compounds rated in accordance with PPI TR-3<sup>vi</sup> and listed in PPI TR-4<sup>vii</sup>.**

**Note 2: Appendix B provides a template that manufacturers may use to communicate compliance with the requirements of this protocol.**

This protocol does not apply to other fusion procedures and does not address operator qualifications that may be required by federal code. This document does not provide guidance on the qualification of fusion procedures. Non-ASTM F2620 or non-F3565 procedures may require additional testing beyond the scope of this document.

PPI members representing PE compound, pipe, and fitting manufacturers worked together to form this document outlining the responsible party, the testing methodology, and the testing frequency to demonstrate the fusion compatibility of their products.

The focus of this document is pipe and fittings made to the following ASTM standards as incorporated by reference in the Code:

- ASTM D2513 - Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings. ASTM D2513 references the following standards:
  - ASTM D2683<sup>viii</sup> - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing

- ASTM D3261<sup>ix</sup> - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

1.1. Excluded Compounds

This document does not apply to products such as Aldyl<sup>®</sup> “A” MDPE pipe and Driscopipe<sup>®</sup> Series 7000 and 8000 HDPE pipe.

1.2. Fabricated Fittings

Fittings fabricated and tested in accordance with ASTM F2206<sup>x</sup> using pipe qualified per the requirements of this document are not required to perform testing per this document.

2.0 Rationale for Test Program to Demonstrate Ability to Fuse

The ability to fuse PE components (i.e., pipe or fittings) is primarily a function of the PE compound and the fusion procedure used. Therefore, the PE compound manufacturer needs to confirm its compounds can be heat fused using a given fusion procedure. It is secondarily a function of the pipe and fitting manufacturing process. Therefore, pipe and fitting manufacturers need to confirm the products they produce with these PE compounds will heat fuse. Pipe and fitting manufacturers demonstrate this through destructive testing of their products.

**Note 3: For the purposes of this document, the PE compound manufacturer is the party that formulates and qualifies the stress-rated compound and holds a PPI TR-4 independent listing. Manufacturers of pipe or fittings that conduct in-line compounding are not considered compound manufacturers (i.e., PPI TR-4 dependent listing owners).**

Section 4.0 of this document details the protocol for testing based on the extensive work published in PPI TR-33<sup>xi</sup>. TR-33 confirmed commercial PE compounds extruded into pipe can be fused to itself (self-fusions) and to other compounds (cross-fusions). Additional work completed in PPI TR-41<sup>xii</sup> on saddle fusion fittings also established the ability to self-fuse and cross-fuse PE compounds. Fusions made in the development of TR-41 used methodology later incorporated into ASTM F2620 and demonstrated the successful cross-fusion of PE compounds. The PE compounds evaluated in TR-33 and TR-41 had ASTM D3350<sup>xiii</sup> melt index cell classification values of:

- ‘3’ (<0.40 to 0.15 g/10 min.), or
- ‘4’ (<0.15 g/10 min., and a melt flow rate 190°C/21.6 kg of 4 – 20 g/10 min.)

The investigative work underpinning TR-33 and TR-41 demonstrated that PE compounds with melt index within the range of cell class ‘3’ and ‘4’ can be successfully fused. This conclusion, formed from the TR-33 and TR-41 testing, provides the basis for the recommendations in this document.

The evaluation protocol here-in is solely intended to evaluate the fusion compatibility between piping system components and is not a measure of the quality or design of the components. The quality of PE compounds and resulting components is presumed to meet the applicable quality requirements of industry standards and the manufacturer's quality control program.

### 3.0 Terminology

The following terminology is used in this document:

- Compound: a specific formulation of PE base material containing all necessary ingredients (e.g., pigment, additives) for the end-use application and which is stress-rated per PPI TR-3 and as listed in PPI TR-4 (public or private listing)
- Self-fusion: The fusion of the same compound to itself
- Cross-fusion: The fusion of a compound to a different compound

### 4.0 When Testing is Required

This section details when testing is required by the PE compound manufacturer, the pipe manufacturer, or the fitting manufacturer. Most of the testing is done by the PPI TR-4 independent listing holder (typically the resin company) as that entity formulated and approved the black or colored compound for extrusion. Note that these required tests are part of PPI's protocol and incorporate some of the Code requirements in Appendix A.

#### 4.1. PE Compound Manufacturer

The PE compound manufacturer must demonstrate that the PPI TR-4 independent listed compound is fusible through testing of heat fused pipe joints made in accordance with Procedure 2 - *Butt Fusion* of ASTM F2620. This protocol does not apply to procedures other than ASTM F2620.

When a change to the PE compound requires the development of sustained pressure data (PPI TR-3, part F.6.2 *Other Modifications*), then a demonstration of fusion capability for the changed PE compound is required.

Demonstration of cross-compound fusion is not required (see Section 2.0) when the PE compound has an ASTM D3350 melt index cell classification value of '3' or '4'.

**Note 4: A change in nomenclature (company name, grade name) does not require a re-demonstration of the ability to fuse. It is recommended that the nomenclature change be documented and attached to the original documentation demonstrating fusion compatibility for the compound.**

The testing required for new and changed PE compounds is provided in Table 1.

Demonstration of both self-fusion and cross-fusion is required if the melt index cell classification of the PE compound per ASTM D3350 is neither '3' nor '4'. Cross-fusions shall be made between the PE compound and both a melt index cell class '3' representative PE compound and a melt index cell class '4' representative PE compound. Testing shall be conducted according to Section 5.1 with the tests based on Table 1.

**Table 1 - Testing Required for PE Compound Manufacturer**

Test	Required		
	New Compound	Compound Change	Neither Melt Index 3 nor 4
Fusion at the extremes of the fusion window (see Table 2)	X	X	X
Tensile per ASTM F2928 <sup>xiv</sup> & ASTM D638	X	X	X
Sustained Pressure @ 176°F per ASTM F2928 & ASTM D1598 using free (unrestrained) end closures	X	X	X
Minimum Hydrostatic Burst @ 73°F per ASTM F2928 & ASTM D1599	X	X	X

#### 4.2. Pipe Manufacturer

When a pipe manufacturer uses a PE compound for the first time that has documented fusion compatibility per Section 4.1, the pipe manufacturer shall confirm through testing it can produce pipe that can be joined by Procedure 2 – Butt Fusion of ASTM F2620. If multiple PE compounds of the same pipe material designation code (e.g., PE2708, PE4710, etc.) are used by a pipe manufacturer, the pipe manufacturer only needs to test pipe produced from one of the compounds. Testing shall be conducted according to Section 5.2.

If a pipe manufacturer uses a PE compound without documented fusion compatibility per Section 4.1, then the pipe manufacturer shall complete the testing requirements for PE Compound Manufacturer listed in Section 4.1 and Table 3.

#### 4.3. Heat Fusion Fitting Manufacturer

A manufacturer of butt, socket, saddle and electrofusion fittings (see Section 1.2 for fabricated fittings) shall follow the requirements of this section.

When a fitting manufacturer uses for the first time a PE compound that has documented fusion compatibility, per Section 4.1, the fitting manufacturer shall confirm through testing it can produce fittings that can be joined via heat fusion. If multiple PE compounds of the same material designation are used by a fitting manufacturer, the fitting manufacturer only needs to test fittings produced from one of the compounds. Testing shall be conducted according to Section

5.3 for butt, saddle, and socket fittings, and Section 5.4 for electrofusion fittings.

Where a fitting manufacturer is using a PE compound without documented fusion compatibility per Section 4.1, the fitting manufacturer shall complete the testing requirements for PE Compound Manufacturer listed in Section 4.1 and Table 3.

## 5.0 What Testing is Required

The following subsection details the specific tests required by manufacturers of compounds, pipes, and fittings.

All fusion joints for testing must be made by a trained fusion operator using calibrated fusion equipment in proper working order.

### 5.1. PE Compound Manufacturer

This subsection details the testing to be conducted for fusion compatibility qualification of a compound per the requirements of Section 4.1.

Test samples shall be prepared for each combination of minimum and maximum heater plate temperatures and interfacial pressures (i.e., four corners of the fusion window as per Table 2). The four test conditions represent a "test set."

**Table 2 - Fusion Conditions for Testing**

<b>Fusion Conditions</b>	<b>Low Temperature (400°F)</b>	<b>High Temperature (450°F)</b>
Low Pressure (60 psi)	X	X
High Pressure (90 psi)	X	X

Table 3 lists the compound manufacturer's required testing protocol for the fused joints. The diameter and wall thickness of the components used for fusion testing are at the discretion of the tester. NPS 2 to 4 are typical choices, and use of hydraulic fusion machine is recommended.<sup>1</sup>

A failure of any test of a fusion condition shall require repeating of that test at that fusion condition. The repeat can be either a partial repeat where the failed test is repeated using extra samples from the original fusion test set or a full repeat of the Protocol where the full battery of tests (Table 3) is completed on

<sup>1</sup>Because fusion is primarily a resin property and is not affected by pipe size, the owner of the stress-rated PE compound will determine, at their sole discretion, the size of pipe (NPS 2 to 4 are recommended) to be used for the demonstration of fusion.

new joints fused at that condition. A partial repeat of a specific test or a full repeat is permitted only once at a given fusion condition.

For example: Sufficient fused pipe specimens are prepared for a given compound with fusions conducted at each of the four combinations in Table 2. The specimens are subsequently tested using the tensile test, minimum hydrostatic burst test, and elevated temperature sustained pressure test per Table 3. If there is a failure, it is permitted to use extra available specimens prepared as part of the original fusion test set to repeat the specific test(s) where failures were observed. In addition to, or alternatively, the PE compound manufacturer may generate new fusion joint specimens at the same fusion condition in which failures were observed, in which case all tests in Table 3 are repeated on these specimens. In the former case, the product passes if the repeat test(s) is successful. If the latter case, the product passes if all newly-fused specimens tested meet Table 3 requirements, regardless of the result of any partial retest.

**Table 3 - PE Compound Manufacturer Required Protocol**

Test	Test Method	# of Test Specimens	Requirement
Tensile	ASTM F2928 & D638	5 @ 400°F / 60 psi	Ductile failure; AND elongation at break $\geq$ 25% or failure initiating outside of the fusion
		5 @ 400°F / 90 psi	
		5 @ 450°F / 60 psi	
		5 @ 450°F / 90 psi	
Minimum Hydrostatic Burst (73°F)	ASTM F2928 & D1599 using free (unrestrained) end closures	5 @ 400°F / 60 psi	Ductile failure; AND hoop/tensile stress of: PE2708: $\geq$ 2520 psi PE4710: $\geq$ 2900 psi
		5 @ 400°F / 90 psi	
		5 @ 450°F / 60 psi	
		5 @ 450°F / 90 psi	
Elevated Temperature Sustained Pressure (176°F)	ASTM F2928 & D1598 using free (unrestrained) end closures	6 @ 400°F / 60 psi	See ASTM D2513-18a, Section A1.2.1
		6 @ 400°F / 90 psi	
		6 @ 450°F / 60 psi	
		6 @ 450°F / 90 psi	

## 5.2. Pipe Manufacturers

A pipe manufacturer shall complete testing per the Protocol in Table 4 on fusion joints which have been fused using the midpoint conditions for temperature (425°F) and pressure (75 psi) of ASTM F2620. These fusion joints can be made using pipes of the same compound (i.e., self-fuse) or with one pipe made from the compound being tested and one pipe made from another fusion-compatible compound (i.e., cross-fuse). The Protocol is successfully completed when all tests in Table 4 achieve the requirements.

**Note 5: Fusions between melt index ‘3’ compounds and melt index ‘4’ compounds are not required as fusion compatibility between melt indices ‘3’ and ‘4’ has been previously demonstrated by TR-33/TR-41.**

**Table 4 - PE Pipe Manufacturer Test Protocol**

<b>Test</b>	<b>Test Method</b>	<b>Number of Test Specimens</b>	<b>Requirement</b>
Tensile	ASTM F2928 & D638	5*	Ductile failure; AND elongation at break $\geq$ 25% or failure initiating outside of the fusion
Minimum Hydrostatic Burst (73°F)	ASTM F2928 & D1599 using free (unrestrained) end closures	5	Ductile failure; hoop/tensile stress of PE2708: $\geq$ 2520 psi PE4710: $\geq$ 2900 psi
Elevated Temperature Sustained Pressure (176°F)	ASTM F2928 & D1598 using free (unrestrained) end closures	6	See ASTM D2513-18a, Section A1.2.1

\*Five (5) equally-spaced specimens taken circumferentially from the pipe. Where the pipe diameter is too small to obtain the five specimens, the five test specimens shall be sourced from multiple fusions with the circumferential position of each specimen varied to represent, as close as reasonably possible, an even separation between sample locations around the circumference.

A failure of any test specimen constitutes a failed test. In the event sufficient specimens were previously prepared, the manufacturer may use those specimens to repeat the failed test. In the event the second test meets the requirements, the test requirement is met and the Protocol has been completed.

A manufacturer may only repeat a failed test in such a manner once. Subsequent failure of any test specimen necessitates preparing new test specimens for all tests (regardless of previous results) and completing a new round of the Test Protocol (Table 4).

### 5.3. Butt, Socket, and Saddle Fusion Fitting Manufacturer

A fitting manufacturer shall complete testing per the Protocol in Table 5 on fusion joints fabricated at the midpoint conditions for temperature (425°F) and interfacial pressure (75 psi) from ASTM F2620. These fusion joints can be made using pipe and fittings made from the same compound (i.e., self-fuse) or a pipe or fitting made from another fusion-compatible compound (i.e., cross-fuse). Provisions for successfully completing the Protocol are the same as stated in Section 5.2.

**Table 5 - PE Fitting Manufacturer Test Protocol**

Test	Test Method	Number of Test Specimens	Requirement
Tensile	ASTM F2928 & D638	5, each specimen from a different joint	Ductile failure; AND elongation at break $\geq 25\%$ or failure initiating outside of the fusion
Minimum Hydrostatic Burst (73°F)	ASTM F2928 & D1599 using free (unrestrained end closures)	5	Ductile failure AND hoop/tensile stress of PE2708: $\geq 2520$ psi PE4710: $\geq 2900$ psi
Elevated Temperature Sustained Pressure (176°F)	ASTM F2928 & D1598 using free (unrestrained) end closures)	6	See ASTM D2513-18a, Table A1.1 for stress & time requirements
Impact (lateral connection only)	ASTM F905	4	No failure in the joint

5.4. Electrofusion Fitting Manufacturer

To demonstrate fusion compatibility of electrofusion fittings, a fitting manufacturer shall perform fusion joint qualification tests as shown in Table 6 which have been joined following ASTM F3565 procedures.

These fusion joints can be made using pipes and fittings of the same compound grade (i.e., self-fuse) or with pipes made from a fusion-compatible compound (i.e., cross-fuse).

A failure of any test specimen constitutes a failed test. In the event sufficient specimens were previously prepared, the manufacturer may use those specimens to repeat the failed test. In the event the second test meets the requirements, the test requirement is met, and the Protocol has been completed.

A manufacturer may only repeat a failed test in such a manner once. Subsequent failure of any test specimen necessitates preparing new test specimens for all tests (regardless of previous results) and completing a new round of the Test Protocol (Table 6).

**Table 6 - PE EF Socket and Saddle Type Fitting Manufacturer Test Protocol**

Required Tests	ASTM Test Method/ Section	Required Joints for Testing	Requirements
Impact (lateral joint only)	F905 per F1055 5.4	2 joints @ minimum installation temperature  2 joints @ maximum installation temperature	Sufficient force to damage pipe or fitting without joint failure. Force in excess of 500 ft·lbf with no failure passes. See ASTM F1055. See Note A
Tensile Strength (socket joint only)	F1055 5.3	2 joints @ minimum installation temperature  2 joints @ maximum installation temperature	Pipe elongation ≥ 25% or pipe failure initiating outside of the fusion.
Minimum Hydraulic Burst Pressure	F1055 5.2.1	2 joints @ minimum installation temperature  2 joints @ maximum installation temperature	Fitting and joint non-failure at hoop/tensile stress of PE2708: ≥ 2520 psi PE4710: ≥ 2900 psi
Sustained Pressure	F1055 5.2.2	2 joints @ minimum installation temperature  2 joints @ maximum installation temperature	Fitting and joint non-failures at 80°C (176°F): PE2708: ≥ 170h at 670 psi PE4710: ≥ 200h at 750 psi
Joint Crush (socket & saddle joints)	F1055 9.4.1 or 9.4.2 per 5.5	2 joints @ minimum installation temperature  2 joints @ maximum installation temperature	No excessive separation of the fusion interface per 9.4.1.5 or 9.4.2.5
Note A - The joint made on the specimen shall not fail when impacted with a force sufficient to break the body or other portion of the specimen. Tests of 500 ft·lbf or higher impact with no failures noted shall be considered as a “pass” impact test (ASTM F1055).			

## 6.0 Reporting

In order to demonstrate compliance with this Technical Note, a report in conformance to the requirements below is required.

### 6.1. PE Compound Manufacturer

The PE compound manufacturer shall retain traceable records of the fusions and testing.

A PE compound manufacturer shall provide a report of the qualification fusion testing performed per this Protocol. This report shall be made available upon request.

The report shall contain the following information:

1. Name of the PE compound
2. Owner of the PE compound
3. Cell class of the PE compound evaluated
4. Description of the pipe used
  - a. OD
  - b. DR
  - c. Sizing system (IPS, DIPS, CTS, etc.)
  - d. Manufacturer of the pipe
5. Edition of ASTM F2620 used for fusion
6. Actual fusion pressure & temperature values used for the test set
7. For cross-fusion evaluation (if required):
  - a. The name of the pipe manufacturers
  - b. Contents of the print lines and
  8. If applicable, identification of the PE compounds used for cross-fusion (i.e., manufacturer, grade, or cell class, as available)
9. A summary of the test results including:
  - a. Reference test hoop stress values
  - b. Fused sample test results
  - c. Conclusion on pass/fail of requirements
  - d. Date period of testing
10. Date of Report
11. Any additional information as determined by the owner of the PE compound (e.g., a change in nomenclature, or notification that this report supersedes any prior reports on the PE compound)

## 6.2. Pipe Manufacturer or Fitting Manufacturer

The pipe or fitting manufacturer shall retain traceable records of the fusions and testing.

A pipe or fitting manufacturer shall provide a report of the qualification fusion testing as required by this Protocol. This report shall be made available upon request.

The report should include:

1. The name of the pipe or fitting manufacturer demonstrating compliance with this Protocol.
2. A statement to the effect that a compound qualified by this Protocol was used in the fabrication of the pipe and/or fittings used in the testing.
3. The print line of the pipe and/or fittings utilized in the testing.
4. Name of the PE compound
5. Owner of the PE compound
6. Cell class of PE compound
7. Date of Report

8. Description of the pipe or fitting used
  - a. OD
  - b. DR
  - c. Sizing system (IPS, DIPS, CTS, etc.)
  - d. Manufacturer of the pipe or fitting
9. Edition of ASTM F2620 (or F3565 for EF fittings) used for fusion procedure
10. Actual fusion pressure & temperature values used for the fusions conducted, where applicable.
11. A summary of the test results including:
  - a. Reference test hoop stress values
  - b. Fused sample test results
  - c. Conclusion on pass/fail of requirements
  - d. Date period of testing

## Appendix A -

### Informative Review of Requirements for Federally Regulated Piping Systems

This Appendix provides a summary of Code testing requirements, as interpreted by PPI, that was used as a starting basis for the testing protocol in this document.

U.S. Federal Code Title 49 CFR § 192.281(c) specifies heat fusion joints be completed in accordance with ASTM F2620 or an alternative written procedure that has been demonstrated to provide an equivalent level of safety and proven by test or experience to produce gastight joints.

In the event F2620 is NOT used as the fusion procedure, 49 CFR § 192.283<sup>iv</sup> for gas distribution systems specifies the testing that must document the alternative procedure's performance. PPI's interpretation of the Code required tests are summarized in Table A1 for heat fusion joints and Table A2 for electrofusion joints.

**Table A1 - 49 CFR § 192.283 Required Tests for Pipe and Heat Fusion Fittings made to ASTM D2513-18a**

Connection Type	Test	Test Method	Test Conditions	Requirements
Non-Lateral and Lateral*  One of:	<b>Sustained Pressure</b>	ASTM D1598	73°F (23°C) Hoop stress of 1320 psi for MDPE 1600 psi for HDPE	Failure Time ≥ 1000 h
	<b>Hydrostatic Burst</b>	ASTM D1599	73°F	Ductile failure
<b>AND</b>				
Non-Lateral	<b>Tensile</b>	ASTM D638	73°F	Elongation at break ≥ 25% or failure initiated outside of the fusion area
Lateral*	<b>Impact</b>	ASTM F905	73°F	Joint shall not fail when impacted with a force sufficient to break the body or other portion of the specimen

\*Test methods for lateral connections are not incorporated by reference in the code. Indicated test methods are typically used.

**Table A2 - 49 CFR § 192.283 Required Tests for Electrofusion Fittings made to ASTM F1055-98(2006)**

	<b>Test</b>	<b>Test Method</b>	<b>Test Conditions</b>	<b>Requirements</b>
<b>One of</b>	<b>Hydrostatic Burst Pressure</b> (F1055 9.1)	ASTM D1599	73°F	Joint non-failure at minimum pipe hoop stress 2,520 psi
	<b>Sustained Pressure</b> (F1055 9.2)	ASTM D1598	176°F (80°C) Hoop stress 580 or 670 psi	Joint or fitting failure time ≥ 1000 or 170 h
<b>AND</b>				
<b>One of</b>	<b>Tensile Strength</b> (Couplings) (F1055 9.3)	ASTM D638	73°F	Elongation at break ≥ 25% or failure initiated outside of the fusion area
	<b>Joint Integrity Test</b> (Couplings & Saddles) (F1055 9.4)	ASTM F1055	73°F	Separation of the fitting from the pipe at the fusion interface constitutes a failure of the test.

## Appendix B -

### Non-Mandatory Suggested Format for Manufacturer Letter of Compliance

Manufacturers of pipe and fittings have provided “Manufacturer Letters of Compliance” to gas utilities to demonstrate qualification of generic fusion procedures on their products to 49 CFR, Part 192 §192.283. These letters were historically attached as appendices to PPI TR-33 and TR-41 but were later removed due to lack of consistency and the complexities of maintaining the documents.

This Appendix is intended to provide manufacturers of plastic pipe and fitting components a template to demonstrate compliance with the fusion qualification requirements of this document.

It is recommended that the following template text be used on manufacturer’s letterhead:

#### **Manufacturer Letter of Compliance for Generic Heat Fusion Joining Qualification**

Date: <MMM-DD-YYYY>

Re: <Pipe or Fitting Manufacturer’s operating name> Letter of Compliance to PPI TN-73

<Insert Manufacturer’s operating name> has qualified the fusion compatibility of its <Insert products (i.e. pipe, tubing or fittings)> in accordance with TN-73 “Fusion Qualification Requirements for Polyethylene Natural Gas Distribution Pressure Pipes and Fittings” and U.S. Department of Transportation Regulation 49 CFR, Part 192 §192.283 when joined in accordance with ASTM F2620 *Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings*.

<Pipe or fitting manufacturer legal name>, <operating as Pipe or Fitting manufacturer operating name, (if different)> asserts that <insert material designation(s)> compound(s) used to manufacture products in compliance with ASTM D2513 *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings* were qualified as fusion compatible in accordance with TN-73.

<insert material designation(s)> <Insert products (i.e. pipe, tubing or fittings)> marked with an “E” in accordance with Section 5.6, Table 5, and Sections 7.2 and/or 7.5 of ASTM D2513-18a *affirms that the pipe or fitting manufacturer and resin manufacturer have verified their products are fusible per ASTM F2620 in accordance with PPI TN-73. However, qualification of joining procedures by operators in accordance with applicable regulations may still be required.*

<Insert Manufacturer’s operating name> will retain traceable records of the testing used to demonstrate compliance.

## Endnotes

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- <sup>i</sup> ASTM F2620 *Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings*, ASTM International, West Conshohocken, PA.
- <sup>ii</sup> ASTM F3565 *Standard Practice for Electrofusion Joining Polyethylene (PE) Pipe and Fittings for Pressure Pipe Service*, ASTM International, West Conshohocken, PA.
- <sup>iii</sup> ASTM F1055 *Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing*, ASTM International, West Conshohocken, PA.
- <sup>iv</sup> 49 CFR § 192.283 "Plastic pipe: Qualifying joining procedures", as amended at 86 FR 2240, Jan. 11, 2021, United States Federal Code for the Transportation of Natural and Other Gas by Pipeline, 2024
- <sup>v</sup> ASTM D2513, *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings*, ASTM International, West Conshohocken, PA.
- <sup>vi</sup> PPI TR-3 *HDB / HDS / PDB / SDR / MRS / CRS Policies*, Plastics Pipe Institute, [www.plasticpipe.org](http://www.plasticpipe.org).
- <sup>vii</sup> PPI TR-4 *HDB/HDS/SDB/PDB/MRS Listed Materials For Thermoplastic Piping Materials or Pipe*, Plastics Pipe Institute, [www.plasticpipe.org](http://www.plasticpipe.org).
- <sup>viii</sup> ASTM D2683 *Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing*, West Conshohocken, PA; ASTM International.
- <sup>ix</sup> ASTM D3261 *Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing*, West Conshohocken, PA; ASTM International.
- <sup>x</sup> ASTM F2206 *Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE)*, West Conshohocken, PA; ASTM International.
- <sup>xi</sup> PPI TR-33 *Generic Butt Fusion Joining Procedure For Field Joining of Polyethylene Pipe*. [www.plasticpipe.org](http://www.plasticpipe.org)
- <sup>xii</sup> PPI TR-41 *Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping*, Plastics Pipe Institute, Plastics Pipe Institute [www.plasticpipe.org](http://www.plasticpipe.org).
- <sup>xiii</sup> ASTM D3350 *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*, ASTM International, West Conshohocken, PA.
- <sup>xiv</sup> ASTM F2928 *Standard Practice for Specimens and Testing Conditions for Testing Polyethylene (PE) Pipe Butt Fusions Using Tensile and Hydrostatic Test Methods*, ASTM International, West Conshohocken, PA.