Fusion Compatibility of Teel Polyethylene Pipe

Why Teel's pipe products are fusible according to ASTM F2620 and how the standard works

Introduction

Teel's polyethylene pipe is fusible according to the generic fusion standards in ASTM F2620, meaning our pipe can be fused with any other PE pipe also compatible with ASTM F2620 fusion methods.

Pipe samples used during Teel's ASTM D2513 testing.

Manufacturing Standards

To be fusible per ASTM F2620, pipe must be manufactured according to the applicable product standards: ASTM D2513 for gas pipe and ASTM F718 for all other PE pipe within a particular outside diameter range commonly used across several other industries. Both standards require a Class 3 or Class 4 resin melt index per ASTM D3350, as melt index is the key attribute allowing the generic fusibility of PE pipe.

TABLE 5 Pipe Category

Property	Test Method	Category							
		A	B	C	D	E	F	G	H
Temperature, °F (°C)	. . .	100 (38)	120 (49)	140 (60)	160 (71)	180 (82)	200 (93)	. . .	...
Hydrostatic Design Basis, psi (MPa)	D2837	400 (2.8)	500 (3.4)	630 (4.3)	800 (5.5)	1000 (6.9)	1250 (8.6)	1600 (11.0)	2000 (13.8)
Melt Index[A]	D1238	>0.5	0.2–0.5	0.01–0.3	<0.01[B]	[C]	. . .	. . .	...

Examples: CDB - At 140ºF (60ºC) the HDB is 800 psi (5.5 MPa). The approximate melt index range is 0.2 to 0.5 g/10 min for this PE pipe.
DF - At 160ºF (71ºC) the HDB is 1250 psi (8.6 MPa)[A] .

[A] The Melt Index information in this table is intended to provide guidance relating to heat fusion joining of PE materials, not for classification of materials. This property is not applicable to non-PE materials or to mechanical fittings. See 7.5.
[B] Typically melt flow measured under condition 190/21.6 is less than 4.01 g/10 min.
[C] When a PE pipe or fitting is marked per 7.2 or 7.5 with the letter "E," it affirms that the manufacturer has verified the applicability of generic fusion joining with their products in accordance with PPI TR-33 and PPI TR-41 by joining to itself and to other "E" materials and testing the joints in accordance with applicable regulations. However, qualification of joining procedures by operators in accordance with applicable regulations may still be required. Information about manufacturers who have verified PPI TR-33 and PPI TR-41 generic fusion joining with their products is found in PPI TR-33 and PPI TR-41. Consult PPI and the manufacturer for additional information.

Table 5 of ASTM D2513-18a showing footnote "C" where regulations for marking pipe with an "E" are specified.

Pipe that meets D2513 standards, including Teel's, are marked with an "E" in the print line as an easy reference for fusion crews in the field.

Rationale for the ASTM F2620 Generic Fusion Standard

Since the 1990s, ongoing and updated evaluations have demonstrated the generic fusion joining compatibility of industry-standard PE pipe. Tests have been conducted on fused PE pipe

1) from a variety of major manufacturers,
2) made with a broad range of resins,
3) and with pipe intended for various applications (such as PE water pipe fused to PE gas pipe).

This testing and evaluation, conducted by Plastics Pipe Institute (PPI), initially lead to the generic fusion joining standards PPI TR-33 (butt fusion) and PPI TR-41 (saddle fusion), which served as the basis for the current ANSI-approved industry standard ASTM F2620.

ASTM F2620 contains the most current PE fusion joining procedures and practices, while PPI TR-33 and TR-41 now serve as industry references detailing the testing conducted to validate the basic fusion procedure in ASTM F2620.

Verifying Products are ASTM F2620 Fusion Compatible

PE pipe manufacturers are required to verify their products are made to the applicable product standards. This verification must come in the form of a manufacturer's letter of compliance stating the products have been tested according to a qualified evaluation process. This letter then qualifies their products, verifying their fusibility according to the generic standard in ASTM F2620.

Qualified Testing and Evaluation Process

PPI's standard TN-73, *Fusion Qualification Requirements for PE Natural Gas Pipes & Fittings*, details the qualified testing protocol and evaluation process all manufacturers should follow to qualify their products are fusible according to ASTM F2620. Tests are included for PE compounds, pipe, and fittings. Required tests, test parameters, and acceptable results are specified.

TN-73 compound manufacturer testing standards include fusion tests with varied heater temperature and pressure combinations. Once fused samples are created using these combinations, sample evaluation includes tensile testing according to ASTM F2928 and D638, pressure testing according to ASTM F2928 and D1598, and hydrostatic burst testing according to ASTM F298 and D1599. Tests are also required when any significant change is made to the PE compound.

When a manufacturer produces pipe with an ASTM F2620-compatible compound for the first time, the manufacturer must replicate the testing conducted by the compound manufacturer as well as perform bend back testing according to ASTM F2620 and impact testing according to ASTM F905.

Not only have Teel's PE pipe products passed test standards, but Teel participated in the creation of TN-73 along with other industry leaders and technical experts to help ensure compatibility across the industry.

Conclusion

Teel customers can be confident in the fusibility of Teel's PE pipe products with any other ASTM F2620 compliant pipe products, even in cross-industry products such as gas pipe to water pipe. Teel has not only conducted the necessary testing to comply with applicable regulations, but is an industry leader helping to set the standards for quality and consistency in the plastic pipe industry.