



Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings¹

This standard is issued under the fixed designation F2620; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—Table 2 was editorially corrected for clarity in October 2021.

^{ε2} NOTE—Table 2 was editorially corrected in March 2022.

1. Scope*

1.1 This practice describes procedures for making joints with polyethylene (PE) pipe and fittings by means of heat fusion joining in, but not limited to, a field environment. Other suitable heat fusion joining procedures are available from various sources including pipe and fitting manufacturers. This practice does not purport to address all possible heat fusion joining procedures, or to preclude the use of qualified procedures developed by other parties that have been proved to produce reliable heat fusion joints.

1.2 The parameters and procedures are applicable only to joining polyethylene pipe and fittings of related polymer chemistry. They are intended for PE fuel gas pipe in accordance with Specification [D2513](#) and PE potable water, sewer and industrial pipe manufactured in accordance with Specification [F714](#), Specification [D3035](#), and AWWA C901 and C906. Consult with the pipe manufacturers to make sure they approve this procedure for the pipe to be joined (see [Appendix X1](#)).

NOTE 1—The parameters and procedures shown for Section 8. Procedure 2—Butt Fusion, were developed and validated using testing documented in Plastic Pipe Institute (PPI) TR-33. The parameters and procedures shown in Section 9. Procedure 3—Saddle Fusion, were developed and validated using testing documented in PPI TR-41.

NOTE 2—Information about polyethylene pipe and fittings that have related polymer chemistry is presented in Plastics Pipe Institute (PPI) TR-33 and TR-41.

1.3 Parts that are within the dimensional tolerances given in present ASTM specifications are required to produce sound joints between polyethylene pipe and fittings when using the joining techniques described in this practice.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 The text of this practice references notes, footnotes, and appendixes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the practice.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[D2513](#) Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings

[D3035](#) Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

[F714](#) Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

[F1056](#) Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings

[F3124](#) Practice for Data Recording the Procedure used to Produce Heat Butt Fusion Joints in Plastic Piping Systems or Fittings

[F3183](#) Practice for Guided Side Bend Evaluation of Polyethylene Pipe Butt Fusion Joint

[F3190](#) Practice for Heat Fusion Equipment (HFE) Operator Qualification on Polyethylene (PE) and Polyamide (PA) Pipe and Fittings

¹ This practice is under the jurisdiction of ASTM Committee [F17](#) on Plastic Piping Systems and is the direct responsibility of Subcommittee [F17.20](#) on Joining.

Current edition approved Dec. 1, 2020. Published October 2021. Originally approved in 2006. Last previous edition approved in 2020 as F2620 – 20. DOI: 10.1520/F2620-20AE02.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 PPI Documents:

TR-33 Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene³

TR-41 Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping³

2.3 AWWA Documents:

AWWA C901 Standard for Polyethylene (PE) Pressure Pipe and Tubing, ½ in. (13 mm) through 3 in. (76 mm), for Water Service⁴

AWWA C906 Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 in. (100 mm) through 63 in. (1575 mm), for Water Distribution and Transmission⁴

2.4 CFR Document:⁵

49 CFR § 192.285 Plastic Pipe: Qualifying persons to make joints

3.2 The heat-fusion procedures covered in this practice are socket fusion, butt fusion, and saddle fusion.

3.2.1 Procedure 1, Socket Fusion—The socket-fusion procedure involves simultaneously heating the outside surface of a pipe end and the inside of a fitting socket, which is sized to be smaller than the smallest outside diameter of the pipe. After the proper melt has been generated at each face to be mated, the two components are joined by inserting one component into the other. See Fig. 1. The fusion bond is formed at the interface resulting from the interference fit. The melts from the two components flow together and fuse as the joint cools. Optional alignment devices are used to hold the pipe and socket fitting in longitudinal alignment during the joining process; especially with pipe sizes IPS 3 in. (89 mm) and larger. Automated socket fusion is not addressed in this procedure.

3.2.2 Procedure 2, Butt Fusion—The butt-fusion procedure in its simplest form consists of heating the squared ends of two pipes, a pipe and a fitting, or two fittings, by holding them against a heated plate, removing the heater plate when the proper melt is obtained, promptly bringing the ends together, and allowing the joint to cool while maintaining the appropriate applied force.

3.2.2.1 An appropriately sized butt fusion machine is used to clamp, align and face the pipe or fitting ends and to apply the specified fusion force. See Fig. 2.

3.2.3 Procedure 3, Saddle Fusion—The saddle-fusion procedure involves melting the concave surface of the base of a saddle fitting, while simultaneously melting a matching pattern on the surface of the pipe, bringing the two melted surfaces

3. Summary of Practice

3.1 The principle of heat fusion joining of polyethylene (PE) pipe is to heat two prepared surfaces to a designated temperature, then fuse them together by application of a sufficient force. This force causes the melted materials to flow and mix, thereby resulting in fusion.

³ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.

⁴ Available from American Water Works Association (AWWA), 6666 W. Quincy Ave., Denver, CO 80235, <http://www.awwa.org>.

⁵ Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.access.gpo.gov>.

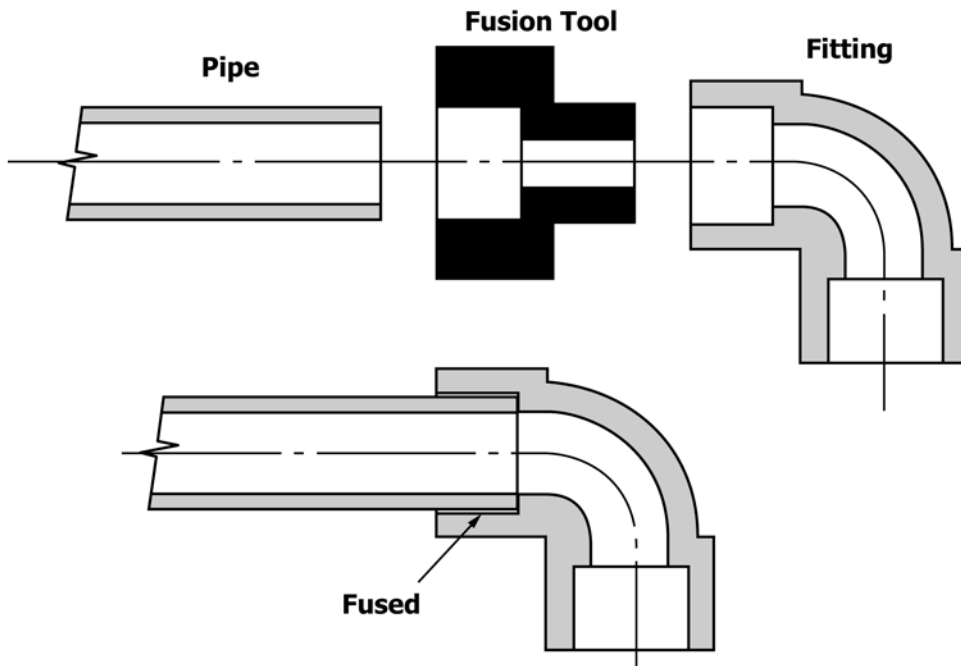


FIG. 1 Socket Fusion

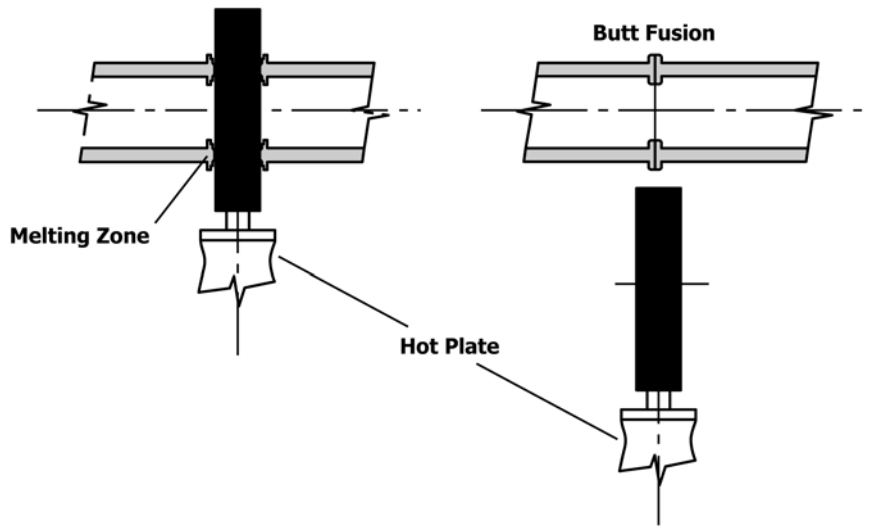


FIG. 2 Butt Fusion

together and allowing the joint to cool while maintaining the appropriate applied force. See Fig. 3.

3.2.3.1 An appropriately sized saddle fusion machine is used to clamp the pipe main and the fitting, align the parts and apply the specified fusion force.

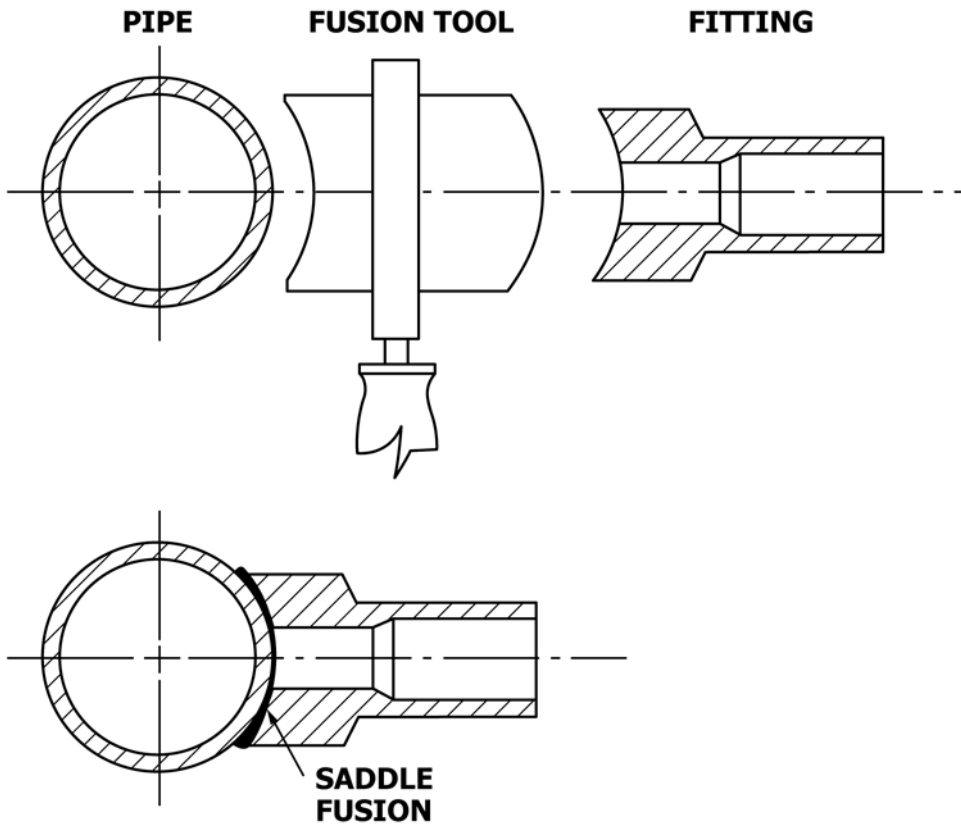


FIG. 3 Saddle Fusion