



Designation: F3524/F3524M – 23

Standard Specification for Polyamide-12 (PA12) Line Pipe¹

This standard is issued under the fixed designation F3524/F3524M; 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.

1. Scope*

1.1 This specification covers requirements and test methods for polyamide-12 (PA12) materials, pipe and fittings for pressure or non-pressure oil and gas producing applications to convey fluids such as oil, dry or wet gas, multiphase fluids, and non-potable oilfield water. This specification does not cover pipe for gas distribution applications.

1.1.1 See Specification F2785 for PA12 pipe and fittings intended for use in the distribution of natural gas, or for use with liquefied petroleum gas.

1.1.2 Pipe and fittings covered by this specification shall not be joined using taper pipe threads. Butt fusion joining shall be done in accordance with Practice F3372. In-plant quality control programs are described in Appendix X1. Design considerations are discussed in Appendix X2.

1.2 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard

1.3 *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.*

1.4 *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.*

¹ This test method is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.68 on Energy Piping Systems.

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2. Referenced Documents

2.1 ASTM Standards:²

- D638 Test Method for Tensile Properties of Plastics
- D648 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
- D789 Test Method for Determination of Relative Viscosity of Concentrated Polyamide (PA) Solutions
- D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
- D1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D1603 Test Method for Carbon Black Content in Olefin Plastics
- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2290 Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe
- D2837 Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
- D4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
- D6779 Classification System for and Basis of Specification for Polyamide Molding and Extrusion Materials (PA)
- F412 Terminology Relating to Plastic Piping Systems
- F1473 Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
- F1733 Specification for Butt Heat Fusion Polyamide(PA) Plastic Fitting for Polyamide(PA) Plastic Pipe and Tubing
- F1973 Specification for Factory Assembled Anodeless Risers and Transition Fittings in Polyethylene (PE) and

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.

*A Summary of Changes section appears at the end of this standard

Polyamide 11 (PA11) and Polyamide 12 (PA12) Fuel Gas Distribution Systems

F2145 Specification for Polyamide 11 (PA 11) and Polyamide 12 (PA12) Mechanical Fittings for Use on Outside Diameter Controlled Polyamide 11 and Polyamide 12 Pipe and Tubing

F2767 Specification for Electrofusion Type Polyamide-12 Fittings for Outside Diameter Controlled Polyamide-12 Pipe and Tubing for Gas Distribution

F2785 Specification for Polyamide 12 Gas Pressure Pipe, Tubing, and Fittings

F3372 Practice for Butt Fusion Joining of PA12 Pipe and Fittings

2.2 ISO Standards:³

307 Plastics -- Polyamides -- Determination of viscosity number

1183 Plastics -- Methods for determining the density of non-cellular plastics -- Part 1: Immersion method, liquid pycnometer method and titration method

527-1 Plastics -- Determination of tensile properties -- Part 1: General principles

527-2 Plastics -- Determination of tensile properties -- Part 2: Test conditions for moulding and extrusion plastics

178 Plastics -- Determination of flexural properties

179 Plastics -- Determination of Charpy impact properties -- Part 1: Non-instrumented impact test

75-1 Plastics -- Determination of temperature of deflection under load -- Part 1: General test method

75-2 Plastics -- Determination of temperature of deflection under load -- Part 2: Plastics and ebonite

16486-1 Plastics piping systems for the supply of gaseous fuels — Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing — Part 1: General

2.3 Military Standard:⁴

Military Standard 129P Standard Practice—Military Marking for Shipment and Storage

2.4 Federal Standard:⁴

FED-STD-123G Federal Standard Marking for Shipment (Civil Agencies)

Federal Register Vol. 71, No. 50, March 15, 2006

2.5 PPI Standards:⁵

PPI TR-3 Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Pressure Design Basis (PDB), Strength Design Basis (SDB), and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

PPI TR-4 Listing of Hydrostatic Design Basis (HDB), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings for Thermoplastic Piping Materials or Pipe

2.6 NORSOK Standards:⁶

M-710, 3rd Edition Qualification of non-metallic materials and manufacturers – Polymers

3. Terminology

3.1 *Definitions*—Unless otherwise specified, definitions are in accordance with Terminology **F412**, and abbreviations are in accordance with Terminology **D1600**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *multiphase fluid, n*—oil, gas, and water in any combination produced from one or more oil or gas wells, or recombined oil or gas well fluids that may have been separated in passing through surface facilities.

3.2.2 *oilfield water, n*—fresh or salt water transported by pipeline, regardless of purity or quality, from wells or surface locations for the purpose of providing water injection to underground reservoirs; or disposing of waste water from hydrocarbon or gas production, processing, or storage facilities.

3.2.3 *production run, n*—the continuous extrusion of pipe of a specific diameter, wall thickness and material compound.

3.2.3.1 *Discussion*—Continuous production may be temporarily interrupted by loss of power or circumstances such as breakdowns or screen changes, etc.; however, a change of diameter or wall thickness (dimension ratio) or material compound constitutes a new production run.

3.2.4 *rounding device, n*—equipment, devices, clamps, and so forth, used to temporarily hold the pipe round while measurements are made.

3.2.5 *sample, n*—pipe or an element of pipe that represents a quantity of pipe and provides a specimen or specimens for testing.

3.2.6 *specimen, n*—pipe or an element of pipe that is subjected to test.

3.2.7 *standard thermoplastic material designation code, n*—the pipe material designation code shall consist of the abbreviation for polyamide (PA) followed by Arabic numerals which describe the short-term properties in accordance with Classification **D6779**, the hydrostatic design stress for water at 73.4 °F [23 °C] in units of 100 psi with any decimal figures dropped.

3.2.7.1 *Discussion*—Where the hydrostatic design stress code contains less than two figures, a zero is used before the number. Thus, a complete material designation code shall consist of two letters and five figures for polyamide pipe materials. For example, PA 42316 is a grade of polyamide 12 with a 1600 psi design stress for water at 73.4 °F [23 °C].

4. Materials

4.1 Polyamide-12 compounds suitable for use in the manufacture of pipe and fittings under this specification shall meet the following requirements:

³ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

⁴ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁵ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.

⁶ Available from Standards Norway, Strandveien 18, P.O. Box 242 N-1326 Lysaker, NORWAY. Email: petroleum@standard.no