



*NSF International Standard /
American National Standard*

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Plastics Piping System Components and Related Materials



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for Plastics —

Plastics piping system components and related materials

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Foreword²

The purpose of this Standard is to establish minimum physical, performance, and health effects requirements for plastics piping system components and related materials.

This edition of the Standard contains the following revisions:

Issue 85

Two new QC tables were added to Section 9.

Issue 86

Normative references were updated.

Issue 87

This revision added a note to Section 5.7.2 for clarification and testing guidance.

Issue 88

Table 9.29 was updated.

Issue 89

CSA B181.0 was added as a reference to Table 9.35.

Issue 90

References in Table 9.20 were updated.

Issue 91

A QC table for cured-in-place pipe liners per ASTM F1216 was added.

Issue 92

Guidance regarding required testing when a compound is modified was incorporated into Section 5.8.

Issue 93

Product Standard NSF 358-3 was added to Table 9.37.

Issue 95

Corrections were made to Tables 9.29 and 9.35.

² The information contained in this Foreword is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI's requirements for an ANS. As such, this Foreword may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

This Standard was developed by the NSF Joint Committee on Plastics using the consensus process described in NSF Standards Development Policies and accredited by ANSI.

Suggestions for improvement of this Standard are welcome. This Standard is maintained on a Continuous Maintenance schedule and can be opened for comment at any time. Comments should be sent to Chair, Joint Committee on Plastics at standards@nsf.org, or c/o NSF International, Standards Department, PO Box 130140, Ann Arbor, Michigan 48113-0140, USA.

NSF/ANSI Standard for Plastics —

Plastics piping system components and related materials

1 General

1.1 Purpose

This Standard establishes minimum physical, performance, and health effects requirements for plastic piping system components and related materials. These criteria were established for the protection of public health and the environment.

1.2 Scope

The physical, performance, and health effects requirements in this Standard apply to thermoplastic and thermoset plastic piping system components including, but not limited to, pipes, fittings, valves, joining materials, gaskets, and appurtenances. The established physical, performance, and health effects requirements also apply to materials (resin or blended compounds) and ingredients used to manufacture plastic piping system components. This Standard provides definitions and requirements for materials, ingredients, products, quality assurance, marking, and recordkeeping. Plastic piping system components which are manufactured to one of the normative references in Section 2 and do not have integral connections specifically intended for plastic piping systems are not covered by this Standard.

1.3 Materials, design, and construction

For plastic piping system components and materials cited by the references in Section 2, the materials, design, and construction requirements of this Standard and the applicable product standard(s) in Section 2 shall apply. When materials, designs, or constructions are utilized that are not cited in Section 2, the plastic piping system components and related materials shall comply with the applicable requirements of this Standard. Plastic piping system components and related materials that incorporate materials, designs, or constructions not cited in Section 2 shall be acceptable, provided that such plastic piping system components and related materials can be demonstrated to be at least equivalent in terms of strength, quality, effectiveness, durability, and safety to those that are cited in this Standard.

2 Normative references

The following documents contain requirements that, by reference in this text, constitute requirements of this Standard. At the time of publication, the indicated editions were valid. All of the documents are subject to revision, and parties are encouraged to investigate the possibility of applying the recent editions of the documents indicated below. It is the responsibility of the user of this Standard to determine the acceptance of the referenced Standards to the application and requirements of the local jurisdictions. The most recent published edition of the document shall be used for undated references.

2.1 Normative references for plastic pipe and related components

ASME A112.4.14-2004. *Manually Operated, Quarter-Turn Shutoff Valves for Use in Plumbing Systems*³

ASME A112.14.1-2003 (2012). *Backwater Valve*³

ASME A112.18.6 / CSA B125.6-2009 (R2014). *Flexible Water Connector*³

ANSI/ASSE 1049-2009. *Performance Requirements for Individual and Branch Type Air Admittance Valves for Chemical Waste Systems*⁴

ANSI/ASSE 1050-2009. *Performance Requirements for Stack Air Admittance Valves for Sanitary Drainage Systems*⁴

ANSI/ASSE 1051-2009. *Performance Requirements for Individual and Branch Type Air Admittance Valves for Sanitary Drainage Systems*⁴

ANSI/ASSE 1061-2015. *Performance Requirements for Push-Fit Fittings*⁴

ASTM B858-06 (2012). *Standard Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys*⁵

ASTM D1785-15. *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120*⁵

ASTM D2235-04 (2016). *Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings*⁵

ASTM D2239-12a. *Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter*⁵

ASTM D2241-15. *Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)*⁵

ASTM D2464-15. *Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80*⁵

ASTM D2466-15. *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40*⁵

ASTM D2467-15. *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80*⁵

ASTM D2513-16a. *Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings*⁵

ASTM D2564-12. *Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems*⁵

ASTM D2609-15. *Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe*⁵

³ American Society of Mechanical Engineers (ASME). Three Park Avenue, New York, NY 10016-5990 <www.asme.org>.

⁴ American Society of Sanitary Engineering (ASSE) for Plumbing and Sanitary Research. 18927 Hickory Creek Drive, Suite 220 Mokena, IL 60448 <www.asse-plumbing.org>.

⁵ American Society for Testing Materials (ASTM). 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 <www.astm.org>.

ASTM D2661-14. *Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings*⁵

ASTM D2665-14. *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings*⁵

ASTM D2672-14. *Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement*⁵

ASTM D2683-14. *Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing*⁵

ASTM D2729-11. *Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings*⁵

ASTM D2737-12a. *Standard Specification for Polyethylene (PE) Plastic Tubing*⁵

ASTM D2846/D2846M-14. *Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems*⁵

ASTM D2949-10. *Standard Specification for 3.25-in Outside Diameter Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings*⁵

ASTM D2996-15. *Standard Specification for Filament-Wound Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe*⁵

ASTM D2997-15. *Standard Specification for Centrifugally Cast Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe*⁵

ASTM D3034-16. *Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings*⁵

ASTM D3035-15. *Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter*⁵

ASTM D3138-04 (2016). *Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components*⁵

ASTM D3261-16. *Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing*⁵

ASTM D3350-14. *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*⁵

ASTM D3517-14. *Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pressure Pipe*⁵

ASTM D5927-17. *Standard Classification System for and Basis for Thermoplastic Polyester (TPES) Injection and Extrusion Materials Based on ISO Test Methods*⁵

ASTM F409-17. *Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings*⁵

ASTM F437-15. *Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80*⁵

ASTM F438-15. *Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40*⁵

ASTM F439-13. *Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80*⁵

ASTM F441/F441M-15. *Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80*⁵

ASTM F442/F442M-13e1. *Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR)*⁵

ASTM F477-14. *Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe*⁵

ASTM F480-14. *Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR) SCH 40 and SCH 80*⁵

ASTM F493-14. *Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings*⁵

ASTM F628-12e2. *Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe with a Cellular Core*⁵

ASTM F656-15. *Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride)(PVC) Plastic Pipe and Fittings*⁵

ASTM F667/F667M-16. *Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings*⁵

ASTM F679-16. *Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings*⁵

ASTM F714-13. *Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter*⁵

ASTM F794-03 (2014). *Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter*⁵

ASTM F876-15a. *Standard Specification for Cross-linked Polyethylene (PEX) Tubing*⁵

ASTM F877-11a. *Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot- and Cold- Water Distribution Systems*⁵

ASTM F891-16. *Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core*⁵

ASTM F894-13. *Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe*⁵

ASTM F949-15. *Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings*⁵

ASTM F1055-16. *Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing*⁵

ASTM F1281.11. *Standard Specification for Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Pressure Pipe*⁵

ASTM F1282-17. *Standard Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe*⁵

ASTM F1336-15. *Standard Specification for Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings*⁵

ASTM F1412-16. *Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems*⁵

ASTM F1483-15. *Standard Specification for Oriented Poly(Vinyl Chloride), PVCO, Pressure Pipe*⁵

ASTM F1488-14. *Standard Specification for Coextruded Composite Pipe*⁵

ASTM F1498-08 (2012)e1. *Standard Specification for Taper Pipe Threads 60° for Thermoplastic Pipe Fittings*⁵

ASTM F1499-12. *Standard Specification for Coextruded Composite Drain, Waste, and Vent Pipe (DWV)*⁵

ASTM F1504-14. *Standard Specification for Folded Poly(Vinyl Chloride) (PVC) Pipe for Existing Sewer and Conduit Rehabilitation*⁵

ASTM F1533-01 (2009). *Standard Specification for Deformed Polyethylene (PE) Liner*⁵

ASTM F1673-10 (2016). *Standard Specification for Polyvinylidene Fluoride (PVDF) Corrosive Waste Drainage Systems*⁵

ASTM F1732-12. *Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer and Drain Pipe Containing Recycled PVC Material*⁵

ASTM F1760-16. *Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content*⁵

ASTM F1807-17. *Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing*⁵

ASTM F1866-13. *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings*⁵

ASTM F1960-15. *Standard Specifications for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing*⁵

ASTM F1961-09. *Standard Specification for Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Cross-linked Polyethylene (PEX) Tubing*⁵

ASTM F1970-12e1. *Standard Specification for Special Engineered Fittings, Appurtenances or Valves for Use in Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride)(CPVC) Systems*⁵

ASTM F1974-09 (2015). *Standard Specification for Metal Insert Fittings for Polyethylene/Aluminum/Polyethylene and Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene Composite Pressure Pipe*⁵

ASTM F1986-01 (2011). *Standard Specification for Multi-layer Pipe Type 2, Compression Fittings, and Compression Joints for Hot and Cold Drinking-Water Systems*⁵

ASTM F2080-16. *Standard Specification for Cold-Expansion Fittings with Metal Compression Sleeves for Cross-linked Polyethylene (PEX) Pipe and SDR9 Polyethylene Raised Temperature (PE-RT) Pipe*⁵

ASTM F2098-15. *Standard Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert Fittings and SDR9 polyethylene of Raised Temperature (PRRT) Tubing*⁵

ASTM F2158-08 (2016). *Standard Specification for Residential Central-Vacuum Tube and Fittings*⁵

ASTM F2159-14. *Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-Linked Polyethylene (PEX) Tubing*⁵

ASTM F2262-09. *Standard Specification for Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene Tubing OD Controlled SDR9*⁵

ASTM F2306/F2306M-14e1. *Standard Specification for 12 to 60 in. [300 to 1500 mm] Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications*⁵

ASTM F2389-17a. *Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems*⁵

ASTM F2390-12. *Standard Specifications for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent (DWV) Pipe and Fittings Having Post-Industrial Recycle Content*⁵

ASTM F2434-14. *Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing*⁵

ASTM F2618-15. *Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe Fittings for Chemical Waste Drainage Systems*⁵

ASTM F2623-14. *Standard Specification for Polyethylene of Raised Temperature (PE-RT) SDR Tubing*⁵

ASTM F2648/F2648M-13. *Standard Specification for 2 to 60 in [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications*⁵

ASTM F2736-13e1. *Standard Specification for 6 to 30 in [152 to 762 mm] Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe*⁵

ASTM F2764/F2764M-17. *Standard Specification for 6 to 60 in [150 to 1500 mm] Polypropylene (PP) Corrugated Double and Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications*⁵

ASTM F2769-16. *Standard Specification for Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems*⁵

ASTM F2788/F2788M-15. *Standard Specification for Metric and Inch-sized Cross-linked Polyethylene (PEX) Pipe*⁵

ASTM F2806-10 (2015). *Standard Specification for Acrylonitrile Butadiene Styrene (ABS) Plastic Pipe (Metric SDR PR)*⁵

ASTM F2855-12. *Standard Specification for Chlorinated Poly(Vinyl Chloride)/Aluminum Chlorinated Poly(Vinyl Chloride) (CPVC-AL-CPVC) Composite Pressure Tubing*⁵

ASTM 2881-11 (2015). *Standard Specification for 12 to 60 in [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications*⁵

ASTM F2929-13. *Standard Specification for Cross-linked Polyethylene (PEX) Tubing of 0.070 in. Wall and Fittings for Radiant Heating Systems up to 75 psig*⁵

ASTM F2969-12. *Standard Specification for Acrylonitrile Butadiene Styrene (ABS) IPS Dimensioned Pressure Pipe*⁵

ANSI/AWWA C900-16. *Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 in Through 60 in (100 mm Through 1500 mm)*⁶

ANSI/AWWA C901-08. *Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in (13 mm) Through 3 in (76 mm), for Water Service*⁶

ANSI/AWWA C904-16. *Cross-Linked Polyethylene (PEX) Pressure Tubing, 1/2 In. (13 mm) Through 3 in. (76 mm), for Water Service*⁶

ANSI/AWWA C906-15. *Polyethylene (PE) Pressure Pipe and Fittings, 4 in through 65 in [100 mm Through 1650 mm] Waterworks*⁶

ANSI/AWWA C907-12. *Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings for Water – 4 in Through 12 in (100 mm Through 300 mm) for Water, Wastewater, and Reclaimed Water Service*⁶

ANSI/AWWA C909-16. *Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe, 4 in [100 mm] and Larger Through 24 in (100 mm through 600 mm), for Water, Wastewater, and Reclaimed Water Service*⁶

ANSI/AWWA C950-2013. *Fiberglass Pressure Pipe*⁶

CAN/CSA B125.3-12. *Plumbing Fittings*⁷

CAN/CSA B137.1-17. *Polyethylene (PE) Pipe, Tubing, and Fittings for Cold Water Pressure Services*⁷

CAN/CSA B137.3-17. *Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications*⁷

CAN/CSA B137.4-17. *Polyethylene (PE) Piping Systems for Gas Services*⁷

CAN/CSA B137.5-17. *Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications*⁷

CAN/CSA B137.6-17. *CPVC Pipe, Tubing, and Fittings for Hot and Cold Water Distribution Systems*⁷

CAN/CSA B137.8-17. *Polybutylene (PB) Piping for Pressure Applications*⁷

CAN/CSA B137.9-17. *Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe Systems*⁷

CAN/CSA B137.10-17. *Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Composite Pressure Pipe Systems*⁷

CAN/CSA B137.11-17. *Polypropylene (PP-R) Pipe and Fittings for Pressure Applications*⁷

CAN/CSA B137.18-17. *Polyethylene of Raised Temperature Resistance (PE-RT) Tubing Systems for Pressure Applications*⁷

⁶ American Water Works Association (AWWA). 6666 W. Quincy Avenue, Denver, CO 80235 <www.awwa.org>.

⁷ Canadian Standards Association (CSA). 5060 Spectrum Way, Suite 100, Mississauga Ontario, Canada L4W 5N6 <www.csa.ca>.

CAN/CSA B181.1-15. *Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings*⁷

CAN/CSA B181.2-15. *Polyvinylchloride (PVC) Drain, Waste, and Vent Pipe and Pipe Fittings*⁷

CAN/CSA B181.3-15. *Polyolefin and Polyvinylidene Fluoride (PVDF) Laboratory Drainage Systems*⁷

CAN/CSA B181.5-15. *Coextruded Acrylonitrile-Butadienestyrene/PolyvinylChloride (ABS/PVC) Drain Waste and Vent Pipe*⁷

CAN/CSA B182.1-15. *Plastic Drain and Sewer Pipe and Pipe Fittings*⁷

CAN/CSA B182.2-15. *PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings (PSM Type)*⁷

CAN/CSA B182.4 -15. *Profile Polyvinylchloride (PVC) Sewer Pipe and Fittings*⁷

CAN/CSA B182.6-15. *Profile polyethylene (PE) Sewer Pipe and Fittings for Leak-Proof Sewer Applications*⁷

CAN/CSA B182.8-15. *Profile polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings*⁷

CAN/CSA B182.11-15. *Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings*⁷

CAN/CSA B182.13-15. *Profile Polypropylene (PP) Sewer Pipe and Fittings for Leak-Proof Sewer Applications*⁷

CAN/CSA B182.14-15. *Profile Steel Reinforced Polyethylene (SRPE) Storm Sewer Pipe and Fittings*⁷

CAN/CSA B182.15-15. *Profile Steel Reinforced Polyethylene (SRPE) Sewer Pipe and Fittings*⁷

CAN/CSA C448 Series 16. *Design and Installation of Ground Source Heat Pump Systems for Commercial and Residential Buildings*⁷

NSF/ANSI 359. *Valves for Cross-linked Polyethylene (PEX) Water Distribution Tubing Systems*

TR-2. *PPI PVC Range Composition Listing of Qualified Ingredients* (2016)⁸

UL 1821. *Thermoplastic Sprinkler Pipe and Fittings for Fire Protection Service*⁹

UL 1285 (6th edition). *Standard for Pipe and Couplings, Polyvinyl Chloride (PVC), and Oriented Polyvinyl Chloride (PVCO) for Underground Fire Service*⁹

2.2 Normative references for compounds and other materials

ASTM D1784-11. *Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds*⁵

ASTM D2581-09. *Standard Specification for Polybutylene (PB) Plastics Molding and Extrusion Materials*⁵

ASTM D3222-05 (2015). *Standard Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials*⁵

ASTM D3350-14. *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*⁵

⁸ Plastic Pipe Institute (PPI). 105 Decker Ct., Suite 825, Irving, TX 75062 <www.plasticpipe.org>

⁹ Underwriters Laboratories (UL). 2600 N.W. Lake Rd., Camas, WA 98607-8542 <www.ul.com>

ASTM D3965-11. *Standard Classification System for and Basis for Specification for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings*⁵

ASTM D4066-13. *Standard Classification System for Nylon Injection and Extrusion Materials (PA)*⁵

ASTM D4067-11. *Standard Classification System for and Basis for Reinforced and Filled Poly(Phenylene Sulfide) (PPS) Injection Molding and Extrusion Materials Using ASTM Methods*⁵

ASTM D4101-14e1. *Standard Specification for Polypropylene Injection and Extrusion Materials*⁵

ASTM D4396-15. *Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Nonpressure Applications*⁵

ASTM D6394-14. *Standard Specification for Sulfone Plastics (SP)*⁵

ASTM D6778-14. *Standard Classification for Polyoxymethylene (POM, Acetal) Molding and Extrusion Materials*⁵

IAPMO PS 36-2014. *Lead-Free Sealing Compounds for Threaded Joints*¹⁰

2.3 International and other normative references

21 CFR §. Parts 1-99. *Food and Drugs* (Rev 4/15)¹¹

21 CFR §. Parts 100-169. *Food and Drugs* (Rev 4/15)¹¹

21 CFR §. Parts 170-199. *Food and Drugs* (Rev 4/15)¹¹

ASTM D543-14. *Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents*⁵

ASTM D638-14. *Standard Test Method for Tensile Properties of Plastics*⁵

ASTM D1243-15. *Standard Test Method for Dilute Solution Viscosity of Vinyl Chloride Polymers*⁵

ASTM D2837-13e1. *Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products*⁵

ASTM D2855-15. *Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets*⁵

ASTM D2992-12. *Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings*⁵

ASTM D3139-98 (2011). *Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals*⁵

ASTM D3212-07 (2013). *Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*⁵

¹⁰ International Association of Plumbing and Mechanical Officials (IAPMO). 4755 E. Philadelphia St., Ontario, CA 91761 <www.iapmo.org>

¹¹ U.S. Government Printing Office. Washington, DC 20402 <www.gpo.gov>.

ASTM D6284-09. *Standard Test Method for Rubber Property – Effect of Aqueous Solutions with Available Chlorine and Chloramine*⁵

ASTM F1216-09. *Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube*⁵

ASTM F2023-15. *Standard Test Method for Evaluating the Oxidative Resistance of Cross-linked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water*⁵

DIN 8074. *Polyethylene (PE) - Pipes PE 63, PE 80, PE 100, PE-HD – Dimensions* (2011)¹²

DIN 8075. *Polyethylene (PE) pipes – PE 63, PE 80, PE 100, PE-HD – General quality requirements, testing* (2011)¹²

DIN 8077. *Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT – Dimensions* (2008)¹²

DIN 8078. *Polypropylene (PP) pipes - PP-H, PP-B, PP-R, PP-RCT - General quality requirements and testing* (2008)¹²

ISO 6509. *Corrosion of metal and alloys – Determination of dezincification resistance of brass*¹³

ISO 6957. *Copper Alloys – Ammonia test for stress corrosion resistance*¹³

ISO 9080:2012. *Plastics piping and ducting systems – Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*¹³

ISO 12162:2009. *Thermoplastics materials for pipes and fittings for pressure applications – Classification, designation and design coefficient*¹³

National Institute of Standards and Technology (NIST)¹⁴

NSF/ANSI 60. *Drinking Water Treatment Chemicals – Health Effects*

NSF/ANSI 61. *Drinking Water System Components – Health Effects*

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* (2017)⁸

PPI TR-4. *PPI 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* (2016)⁸

¹² Deutsches Institut für Normung e. V. (DIN). Burggrafen-strasse 6, 10787 Berlin, Germany <www.din.de>.

¹³ International Organization for Standardization (ISO). 1, ch. de la Voie-Creuse Case postale 56, CH-1211, Geneva Switzerland <www.iso.org>.

¹⁴ National Institute of Standards and Technology (NIST). 100 Bureau Drive, Stop 1070, Gaithersburg, MD 20899-1070 <www.nist.gov>

3 Definitions

The following terms are used in this document:

3.1 appurtenances: Accessories of a plastic piping system designed for special applications or end uses. Appurtenances include, but are not limited to, pipes, fittings, valves, storage tanks, tank liners, special coatings, faucet parts, and riser assemblies.

3.2 bond: The union of surfaces through heat, chemical action, or adhesion that produces a joint strong enough to function as a unit (e.g., heat fusion or solvent fusion).

3.3 building drain: The part of the lowest horizontal piping of a drainage system that receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer beyond the foundation walls of the building or structure.

NOTE — The building sewer generally begins 2 to 5 ft beyond the foundation walls.

3.4 building sanitary sewer: The part of the horizontal piping of a sanitary drainage system that extends from the building sanitary drain, receives the discharge from the building sanitary drain, and conveys it to a public sewer, private sewer, individual sewage disposal system, or other point of disposal.

3.5 building storm sewer: The part of the horizontal piping of a storm drainage system that extends from the building storm drain, receives the discharge of the building storm drain, and conveys it to a public storm sewer, private storm sewer, or other point of disposal.

3.6 calcium carbonate: An ingredient obtained by crushing or grinding limestone or precipitating calcium carbonate by means of chemical processes. Some calcium carbonates are modified by the application of calcium stearate or stearic acid to improve dispersion characteristics.

3.7 calcium stearate: An ingredient consisting of calcium with a mixture of solid organic acids obtained from fats and oils.

3.8 calibration: A comparison of two measurement devices or systems, one of known uncertainty and better accuracy, and one of unknown uncertainty (the unit to be calibrated).

NOTE — The term calibration, as used in this Standard, also involves the process of adjustment – the operation of bringing a measuring instrument into a state of performance / accuracy suitable for use.

3.9 composite pipe: Pipe consisting of two or more different materials arranged with specific functional purpose to serve as pipe.

NOTE — “Composite pipe” is a term used by ASTM. It is also known as multi-layered pipe by PPI and ISO.

3.10 compound: A mixture of polymers with other ingredients such as fillers, stabilizers, catalysts, processing aids, lubricants, modifiers, pigments, or curing agents.

NOTE — Compounds are considered materials; however, not all materials are considered compounds.

3.11 compounder: A corporation, company, or individual that blends, mixes, or otherwise combines ingredients to produce compounds.

3.12 contamination: The presence of a substance not intentionally incorporated in a product.

3.13 continuous waste piping: Components used in a drainage system to connect two or more plumbing fixtures or plumbing fixture components to a common trap.