Designation: F480 – 14 (Reapproved 2022)

An American National Standard

Standard Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80[1]

This standard is issued under the fixed designation F480; 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 water well casing pipe and couplings made from thermoplastic materials in standard dimension ratios (SDR), SCH 40 and SCH 80.

1.2 Specifications are provided for the application of these materials to water well and ground water monitoring applications. Flush threaded joint systems are included for screen and casing used primarily in the construction of ground water monitoring wells (see Practice D5092/D5092M).

1.3 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. (See IEEE/ASTM SI 10.)

NOTE 1—Certain field conditions may require alternative materials to ensure safe long-term use. The user should consult federal, state, and local codes governing the use of thermoplastic materials for well casing or monitor pipe.

NOTE 2—This standard specifies dimensional, performance and test requirements for plumbing and fluid handling applications, but does not address venting of combustion gases.

1.4 Although the pipe sizes and SDR values listed in this specification are generally available, numerous other plastic pipes in Schedule 40 and 80 wall, other SDR values and various outside diameters have been used for well casing. Such products are often selected because they fulfill certain needs and Annex A1 includes a list of these Plastic Pipe Well Casing Specials.

1.5 The following safety hazards caveat pertains only to the test method portion, Section 6, of this specification: *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.*

1.6 *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]

D618 Practice for Conditioning Plastics for Testing

D638 Test Method for Tensile Properties of Plastics

D653 Terminology Relating to Soil, Rock, and Contained Fluids

D1527 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80 (Withdrawn 2013)[3]

D1600 Terminology for Abbreviated Terms Relating to Plastics

D1784 Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D1785 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

D1892 Specification for Styrene-Butadiene Molding and Extrusion Materials (Withdrawn 1987)[3]

D1898 Practice for Sampling of Plastics (Withdrawn 1998)[3]

D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D2235 Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings

D2241 Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

D2282 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (Withdrawn 2006)[3]

D2412 Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

D2444 Practice for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)

[1] This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.61 on Water.

Current edition approved Feb. 1, 2022. Published March 2022. Originally approved in 1976. Last previous edition approved in 2014 as F480 – 14. DOI: 10.1520/F0480-14R22.

[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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

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

D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
D2855 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
D3122 Specification for Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings
D3965 Classification System and Basis for Specifications for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings
D5092/D5092M Practice for Design and Installation of Groundwater Monitoring Wells
F402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
F412 Terminology Relating to Plastic Piping Systems
IEEE/ASTM SI 10 American National Standard for Use of the International System of Units (SI): The Modern Metric System

2.2 *ANSI Standards:*[4]
B1.5 ACME Screw Threads
B1.8 Stub ACME Screw Threads
B1.9 Buttress Inch Screw Threads

2.3 *Federal Standard:*[5]
FED-STD-123 Marking for Shipment (Civil Agencies)

2.4 *Military Standard:*[5]
MIL-STD-129 Marking for Shipment and Storage

2.5 *Other Standards:*
Screw-Threads Standards for Federal Services 1957, Handbook H28, Part III[6]
NSF 14 Plastic Piping System Components and Related Materials
NSF 61 Drinking Water System Components[7]

3. Terminology

3.1 Definitions are in accordance with Terminology F412 and abbreviations are in accordance with Terminology D1600, unless otherwise specified. The abbreviation for acrylonitrile-butadiene-styrene plastic is ABS. The abbreviation for poly-(vinyl chloride) is PVC. The abbreviation for styrene-rubber is SR.

3.2 Ground water investigation terms are in accordance with Terminology D653.

4. Classification

4.1 Well casing is produced in either plain end, belled end, or threaded, and is used for water wells, ground water monitoring, leak detection, recovery systems, dewatering systems, and waste disposal.

5. Materials and Manufacture

5.1 *Specification*—The material described shall meet or exceed the requirements of (*1*) Specification D3965 for ABS with a cell classification of 44322 or 33333, (*2*) Specification D1784 for PVC with a cell classification of 12454 or 14333, or (*3*) Specification D1892 for SR with a cell classification of 4434A. The material so described shall be approved for potable water.

NOTE 3—Caution should be exercised to control heat of hydration during grouting as thermoplastic materials are heat sensitive. Accelerators tend to increase the heat of hydration and are not recommended.

5.2 Acrylonitrile-butadiene-styrene (ABS) well casing pipe and couplings plastic shall be virgin plastic produced by the original compounder (see Specification D1527). The minimum butadiene content is 6 %; the minimum acrylonitrile content is 15 %; the minimum styrene or substituted styrene content, or both, is 15 %; and the maximum content of other monomers is 5 % and lubricants, stabilizers, and colorants.

5.3 Poly(vinyl chloride) (PVC) well casing pipe and couplings plastic shall be made of virgin plastic produced by the original compounder. It shall contain poly(vinyl chloride) homopolymer, and such additives—stabilizers, lubricants, processing aids, impact improvers, and colorants—as needed to provide the required processing and toughness characteristics (see Test Method D638).

5.4 The SR plastics compound shall contain at least 50 % styrene plastics, combined with rubbers to a minimum rubber content of 5 %, and compounding materials such as antioxidants and lubricants, and may contain up to 15 % acrylonitrile combined in the styrene plastics or rubbers, or both. The rubbers shall be of the poly-butadiene or butadiene-styrene type, or both, with a maximum styrene content of 25 % or nitrile type, or both. The combined styrene plastics and rubber content shall be not less than 90 %.

5.5 *Rework Material*—Clean rework material generated from the manufacturer's own well casing pipe and couplings production may be used by the same manufacturer, provided the well casing pipe and couplings produced meet all the requirements of this specification.

5.6 *Solvent Cement:*

5.6.1 *Specification*—The solvent cement shall meet the requirements of Specification D2235 for ABS, Specification D2564 for PVC, or Specification D3122 for SR (see Supplementary Requirements S3).

6. Requirements

6.1 *Workmanship*—The pipe shall be homogeneous throughout and essentially uniform in color, opacity, density, and other properties. The inside and outside surfaces shall be semi-matte or glossy in appearance (depending on the type of plastic) and free of chalking, sticky, or tacky material. The surfaces shall be free of excessive bloom, that is, slight bloom is acceptable. The pipe walls shall be free of cracks, holes, blisters, voids, foreign inclusion, or other defects that are visible to the naked eye and that may affect the wall integrity.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[5] DLA Document Services Building 4/D 700 Robbins Avenue Philadelphia, PA 19111-5094 http://quicksearch.dla.mil/.
[6] U.S. Government Bookstore 710 North Capitol Street N.W. Washington, DC http://bookstore.gpo.gov/.
[7] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.

Machined slots or holes deliberately placed in pipe are acceptable. Bloom or chalking may develop in pipe exposed to direct rays of the sun (ultraviolet radiant energy) for extended periods, and consequently these requirements do not apply to pipe after extended exposure to direct rays of the sun.

6.1.1 *Ground Water Investigations*—Pipe manufactured into products used in ground water investigations should have surfaces that are visually free of oils, grease, dust, and marks imparted as a result of the manufacturing process.

6.2 *Well Casing Pipe:*

6.2.1 *Dimensions*—The outside diameter and wall thickness of the well casing pipe shall meet the requirements given in Table 1 or Table 2 when measured in accordance with Test Method D2122. (See Specification D2282.)

6.2.2 *Wall Thickness Eccentricity*—The wall thickness eccentricity of the pipe shall be within 12 %.

6.2.3 *Length*—The well casing pipe shall be in either 10 ft or 20 ft (3.05 m or 6.10 m) lengths, unless otherwise specified. The allowable tolerance on length shall be +½, –0 in. (+13, –0 mm) when measured in accordance with Test Method D2122.

6.2.4 *Flush Joint Threaded Length*—If specified by the manufacturer or purchaser, the assembled length of flush threaded casing or screen shall be a nominal length such as 5 ft, 10 ft, or 20 ft. Any given laying length the purchaser specifies will constitute an assembled length. The allowable tolerance shall be +½, −⅛ in. (+13, −3 mm) on the components of the assembled laying length. The overall length of all flush threaded screen and casing shall be the nominal or specified laying length plus the length of the exposed male thread (pin).

NOTE 4—The purchaser should specify whether the length is to be the laying length or the overall length. The term "laying length" refers to the overall length less the length required to complete the assembly.

6.3 *Well Casing Pipe Couplings:*

6.3.1 *Socket Dimensions*—The socket dimensions of couplings shall conform to the requirements given in Table 3 and Table 4 when measured in accordance with Test Method D2122.

TABLE 1 Outside Diameters and Tolerance for Thermoplastic Well Casing Pipe, in.

Nominal Pipe Size	Outside Diameter		Out-of-Roundness Maximum Diameter Minus Minimum Diameter		
	Average	Tolerance on Average	SDR41 SDR32.5 SDR26	SDR21 SDR17 SDR13.5	SCH40 and SCH80[A]
2	2.375	±0.006	0.060	0.024	0.024
2½	2.875	±0.007	0.060	0.030	0.030
3	3.500	±0.008	0.060	0.030	0.030
3½	4.000	±0.008	0.100	0.030	0.030
4	4.500	±0.009	0.100	0.030	0.030
5	5.563	±0.010	0.100	0.060	0.060
6	6.625	±0.011	0.100	0.070	0.070
8	8.625	±0.015	0.150	0.090	0.090
10	10.750	±0.015	0.150	0.100	0.100
12	12.750	±0.015	0.150	0.120	0.120
14	14.000	±0.020	0.150	0.150	0.150
15	15.300	±0.020	0.150	0.150	
16	16.000	±0.020	0.150	0.150	0.150

[A] Reference D1527 for ABS and D1785 for PVC.

6.3.2 *Bell Socket Dimensions*—The socket dimensions of well casing pipe bell couplings shall be as shown in Table 5 when measured in accordance with Test Method D2122.

6.3.3 *Bell Socket Wall Thickness*—The wall thickness of an integral bell shall be considered satisfactory if formed from pipe that meets the requirements of this specification.

6.3.4 *Laying Length Dimensions*—The laying length dimensions of well casing pipe couplings shall conform to the requirements given in Table 3, Table 4, and Table 5 when measured in accordance with Test Method D2122.

6.3.5 *Socket Concentricity or Alignment*—The maximum misalignment of axis of couplings with the pipe measured in the plane of the coupling face shall not exceed ¾ in./20 ft (3 mm/1 m) of projected axis when measured in accordance with 7.4.

6.4 *Pipe Stiffness and Flattening:*

6.4.1 *Well Casing Pipe*—The well casing pipe shall have a pipe stiffness at 5 % deflection equal to that shown in Table 6 and Table 7 and shall deflect 60 % of the original diameter (flattening) without cracking, rupture, or other visible evidence of failure when tested in accordance with Test Method D2412. Three specimens shall be tested and all shall pass.

NOTE 5—This test is intended for use as a quality control test, not as a simulated service test.

6.4.2 *Couplings and Bells* shall meet all the designated dimensional requirements of Table 3, Table 4, or Table 5. Molded couplings shall have a pipe stiffness at 5 % deflection equal to that shown in Table 6 and Table 7 and shall deflect 15 % without cracking, rupture, or other visible evidence of failure when tested in accordance with Test Method D2412. Three specimens shall be tested and all shall pass.

6.5 *Impact Resistance Classification*—The impact resistance classification (IC) value for well casing pipe shall be selected from Table 8 by the manufacturer based on the measured average impact values determined in accordance with 7.5.

6.6 *Tup Puncture Resistance*—The well casing pipe and well casing couplings shall deflect 30 % (puncture resistance) without cracking, rupture, or other visible evidence of failure when tested in accordance with 7.6 (Note 7). Three specimens shall be tested and all shall pass.

6.7 *Threads*—Well casing, screens, and couplings having threads shall have either American Standard ACME 2G screw threads, American Standard Stub ACME 2G screw threads, or Buttress screw threads, Class 2, or square form flush joint threads, in accordance with ANSI B1.5 for ACME 2G screw threads, ANSI B1.8 for Stub ACME 2G screw threads, and ANSI B1.9 for Buttress screw threads. Examples of acceptable square form flush joint thread patterns for monitoring well construction are included in the annex.

6.7.1 All ACME, Stub ACME, and Buttress screw threads shall be gaged in accordance with 7.7.

6.7.2 Machining flush joint square threads directly into the wall of the pipe may cause difficulty in measuring the thread dimensions when the pipe is removed from the threading device. The inherent out-of-round condition of the pipe will