PS 12-69 file

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DEPARTMENT OF COMMERCE

National Bureau of Standards

VOLUNTARY PRODUCT STANDARDS

Action on Proposed Withdrawal

In accordance with § 10.12 of the Department's "Procedures for the Development of Voluntary Product Standards" (15 CFR Part 10, as revised; 35 FR 8349 dated May 28, 1970), notice is hereby given of the withdrawal of the following Voluntary Product Standards:

PS 10–69, "Polyethylene (PE) Plastic Pipe (Schedule 40—Inside Diameter Dimensions)".

PS 11–69, "Polyethylene (PE) Plastic Pipe (SDR)".

* PS 12–69, "Polyethylene (PE) Plastic Pipe (Schedules 40 and 80—Outside Diameter Dimensions)".

PS 18–69, "Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (Schedules 40 and 80)".

PS 19–69, "Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe (Standard Dimension Ratio)".

PS 21–70, "Poly(Vinyl Chloride) (PV) Plastic Pipe (Schedules 40, 80, and 120)".

PS 22–70, "Poly(Vinyl Chloride) (PVC) Plastic Pipe (Standard Dimension Ratio)".

This action is taken in furtherance of the Department's announced intentions as set forth in the public notice appearing in the FEDERAL REGISTER of April 18, 1974 (39 FR 13908), to withdraw these standards.

→ The effective date for the withdrawal of these standards will be Sept. 9, 1974. This withdrawal action terminates the authority to refer to these standards as voluntary standards developed under the Department of Commerce procedures.

ERNEST AMBLER,
Acting Director.

JULY 3, 1974.

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A UNITED STATES
DEPARTMENT OF
COMMERCE
PUBLICATION

NBS PRODUCT STANDARD
PS 12-69

Polyethylene (PE) Plastic Pipe (Schedules 40 and 80— Outside Diameter Dimensions)

A VOLUNTARY STANDARD DEVELOPED BY THE NATIONAL BUREAU OF STANDARDS IN CO-OPERATION WITH PRODUCERS, DISTRIBUTORS AND USERS.

For sale by the Superintendent of Documents
U.S. Government Printing Office, Washington, D.C. 20402
(Order by SD Catalog No. C 13.20/2:12-69), Price 15 cents.

PRODUCT STANDARDS

Product Standards are published voluntary standards that establish (1) dimensional requirements for standard sizes and types of various products, (2) technical requirements for the product, and (3) methods of testing, grading, and marking these products. The objective is to define requirements for these products in accordance with the principal demands of the trade. *Product Standards* are published by the National Bureau of Standards of the U.S. Department of Commerce.

Development of a PRODUCT STANDARD

The Bureau's Office of Engineering Standards Services works closely with business firms, trade organizations, testing laboratories, and other appropriate groups to develop such standards. (A group interested in developing a Product Standard may submit a written request to the Office of Engineering Standards Services, National Bureau of Standards.) After determining that the desired standard would be technically feasible and in the public interest, a specific proposal is developed in consultation with interested trade groups and circulated for industry consideration and comment.

Subsequently, a Standard Review Committee is established to review the proposed standard for conformance with the Department of Commerce procedures. The committee includes qualified representatives of producers, distributors, and users or consumers of the product. When approved by the committee, copies of the recommended standard are distributed for consideration and acceptance. When the acceptances show general agreement by all segments of the industry, and when there is no substantive objection deemed valid by the National Bureau of Standards, the Bureau announces approval of the Product Standard and proceeds with its publication.

Use of a PRODUCT STANDARD

Product Standards are developed for the maximum use of industry by ensuring that producers, distributors, and users or consumers cooperate in the development of a voluntary Product Standard. The adoption and use of a Product Standard is *voluntary*. Product Standards are used most effectively in conjunction with legal instrumentalities such as building codes, purchase orders, and sales contracts. When a standard is made part of such a contract, compliance with the standard is enforceable by the buyer or the seller along with other provisions of the contract. There is *no* governmental regulation or control involved.

Purchasers may order products that comply with Product Standards and determine for themselves that their requirements are met. More often, manufacturers refer to the standards in sales catalogs, advertising, invoices, and labels on the product. Commercial inspection and testing programs are also employed for greater effectiveness together with grade labels, hallmarks, and certificates. Such assurance of compliance promotes confidence and understanding between buyers and sellers.

EFFECTIVE DATE

Having been passed through the regular procedures of the Office of Engineering Standards Services, National Bureau of Standards and approved by the acceptors hereinafter listed in part, this Product Standard is issued by the National Bureau of Standards, effective

March 1, 1969

Nat. Bur. Stand. (U.S.), Prod. Stand. 10—69, 14 pages (Mar. 1970)

CODEN: XNPSA

Polyethylene (PE) Plastic Pipe (Schedules 40 and 80— Outside Diameter Dimensions)

Effective March 1, 1969

1. PURPOSE

1.1. The purpose of this Product Standard is to establish nationally recognized dimensions and significant quality requirements for polyethylene (PE) plastic pipe when it is made in Schedule 40 or 80 sizes with the outside diameter controlled. This Product Standard is also intended to provide producers, distributors, engineers, code officials, and users with a basis for common understanding of the characteristics of this product.

2. SCOPE AND CLASSIFICATION

2.1. Scope—This Product Standard covers the principal types, grades, sizes, and pressure ratings for commercially available PE plastic pipe made in Schedule 40 and 80 sizes with the outside diameter controlled for use with socket-type fittings. Included are requirements and methods of test for materials, workmanship, dimensions, sustained pressure, burst pressure, and environmental stress cracking. Methods of marking and labeling to indicate compliance with this Standard are also provided.[1]

2.2. Classification—The PE pastics material and pipe covered by this Product Standard are classified as follows:

2.2.1. Material—PE plastics used to make pipe meeting the requirements of this Standard are categorized by means of two criteria, namely, short-term strength tests and long-term strength tests.

2.2.1.1. Basic materials—This Standard covers pipe made from four PE plastics as defined in the American Society for Testing and Materials (ASTM)[2] D1248–69, *Standard Specifications for Polytheylene Plastics Molding and Extrusion Materials*,[3] in which the requirements are based on short-term tests. These are P 14; P 23; P 33; and P 34.

2.2.1.2. Hydrostatic design stresses—This Standard covers pipe made from PE plastics as defined by three hydrostatic design stresses developed on the basis of long-term tests.[4] These hydrostatic design stresses are 400, 500, and 630 psi for water at 23° C (73.4° F) and apply only to pipe meeting all the requirements of this Standard.

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[1] Information regarding the properties, applications, installation, and maintenance of polyethylene plastic piping is contained in Technical Report PPI–TR8–APR 1968, Installation Procedures for Polyethylene (PE) Plastic Pipe, published by the Plastics Pipe Institute, 250 Park Avenue, New York, New York 10017.

[2] Copies of ASTM publications are obtainable from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

[3] Later issues of all publications specified in this Product Standard may be used providing the requirements are applicable and consistent with the issues designated.

[4] Information regarding the method of test and other criteria used in developing these hydrostatic design stresses may be obtained from the Plastics Pipe Institute (PPI), a Division of the Society of the Plastics Industry, 250 Park Avenue, New York, New York 10017.

2.2.1.3. Pipe materials—This Standard covers pipe made from five PE plastic pipe materials coded as follows:

(1) P 14, with a hydrostatic design stress of 400 psi for water at 23° C (73.4° F), designated as PE1404.

(2) P 23, with a hydrostatic design stress of 500 psi for water at 23° C (73.4° F), designated as PE2305.

(3) P 23, with a hydrostatic design stress of 630 psi for water at 23° C (73.4° F), designated as PE2306.

(4) P 33, with a hydrostatic design stress of 630 psi for water at 23° C (73.4° F), designated as PE3306.

(5) P 34, with a hydrostatic design stress of 630 psi for water at 23° C (73.4° F), designated as PE3406.

2.2.2. Pipe pressure rating (PR)—Pipe meeting the requirements of this Standard is rated for use with water at 23° C (73.4° F) at the maximum internal pressure shown in table 1. These ratings have been calculated in accordance with the International Standards Organization [5] (ISO) equation as defined in 5.1.3. Lower ratings may be recommended at the option of the pipe manufacturer. The sustained pressure requirements (3.4.1) are related to these ratings through the slopes of the strength-time plots for the materials in pipe form.

TABLE 1. *Pressure ratings for water at 23° C (73.4° F) for PE plastic pipe, Schedules 40 and 80*

Nominal pipe size	Pressure ratings [a]					
	PE2306, PE3306 and PE3406		PE2305 [b]		PE1404 [b]	
	Sched. 40	Sched. 80	Sched. 40	Sched. 80	Sched. 40	Sched. 80
inch	*psi*	*psi*	*psi*	*psi*	*psi*	*psi*
½	188	267	149	212	119	170
¾	152	217	120	172	96	137
1	142	199	113	158	90	126
1¼	116	164	92	130	74	104
1½	104	148	83	118	66	94
2	87	127	69	101	55	81
2½	96	134	76	106	61	85
3	83	118	66	94	53	75
3½	75	109	60	86	50	69
4	70	102	55	81	NPR	65
5	61	91	50	72	NPR	58
6	55	88	NPR	70	NPR	56
8	50	---	NPR	---	NPR	---
10	NPR [c]	---	NPR	---	NPR	---
12	NPR	---	NPR	---	NPR	---

[a] These pressure ratings apply only to unthreaded pipe; the industry does not recommend threading PE plastic pipe.

[b] See 2.2.1.3 and 5.1.4 for code designation.

[c] NPR = not pressure rated.

3. REQUIREMENTS

3.1. General—All pipe represented as complying with this Standard shall meet all of the requirements listed herein and shall be marked as specified in section 6.

[5] Address: 1430 Broadway, New York, New York 10018, c/o American National Standards Institute.

3.2. Materials—The PE plastic extrusion compound shall meet the requirements of either P 14, Class C, material; P 23, Class C, material; P 33, Class C, material; or P 34, Class C, material as described in ASTM D1248–69.

3.2.1. Rework material—Clean rework material generated from the manufacturer's own pipe production may be used by the same manufacturer provided that the types of material specified in 3.2 are not mixed with one another and that the pipe produced meets all the requirements of this Standard.

3.2.2. Carbon black—The PE pipe compound shall contain at least 2 percent carbon black when tested in accordance with 4.9. For pipe produced by simultaneous multiple extrusion, this requirement shall apply only to the outer layer.[6]

3.2.3. Density—The PE base resin (uncolored PE) in the pipe compound shall have a density in the range of 0.910 to 0.925 g/cm ^{3} for pipe made from P 14; 0.926 to 0.940 g/cm ^{3} for pipe made from P 23; and 0.941 to 0.965 g/cm ^{3} for pipe made from P 33 and P 34, when determined in accordance with 4.5.

3.3. Pipe dimensions and tolerances—

3.3.1. Outside diameters—The average outside diameters shall be as shown in table 2 when measured in accordance with 4.4 and 4.4.1.

3.3.2. Wall thickness—The wall thickness shall be as shown in table 3 when measured in accordance with 4.4 and 4.4.2.

3.3.3. Wall thickness range—The wall thickness range (eccentricity of the inside and outside circumferences) of the pipe shall not exceed 12 percent when measured in accordance with 4.4 and 4.4.3.

3.3.4. Thickness of outer layer—For pipe produced by simultaneous multiple extrusion, that is, pipe containing two or more concentric layers, the outer layer shall be at least 0.020 inch thick.

3.4. Performance requirements—

3.4.1. Sustained pressure—The pipe shall not fail, balloon, burst, or weep as defined in section 4, ASTM D1598–67, *Standard Method of Test for Time-to-Failure of Plastic Pipe Under Long-Term Hydrostatic Pressure,*[7] at the test pressures given in table 4 when tested in accordance with 4.6.

3.4.2. Burst pressure—The minimum burst pressure of the pipe shall be as given in table 5, when determined in accordance with 4.7.

3.4.3. Environmental stress cracking—There shall be no loss of pressure in the pipe when tested in accordance with 4.8.

3.4.4. Bond—For pipe produced by simultaneous multiple extrusion, the bond between the layers shall be strong and uniform. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly at any point.

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[6] There is evidence that indicates that type, particle size, and dispersion quality of the carbon black does affect the weatherability of the pipe. The problem is being investigated by the Plastics Pipe Institute (PPI) and when reliable test methods are developed, requirements for weatherability, or other suitable requirements to cover this property, will be included in a revision of this Product Standard.

[7] See footnotes 2 and 3, page 1.

10	10.750	±.015	±.075
12	12.750	±.015	±.075

TABLE 3. *Wall thicknesses for PE plastic pipe, Schedules 40 and 80*

Nominal pipe size	Wall thickness			
	Schedule 40		Schedule 80	
	Minimum	Maximum	Minimum	Maximum
inch	*inch*	*inch*	*inch*	*inch*
½	0.109	0.129	0.147	0.167
¾	.113	.133	.154	.174
1	.133	.153	.179	.200
1¼	.140	.160	.191	.214
1½	.145	.165	.200	.224
2	.154	.174	.218	.244
2½	.203	.227	.276	.309
3	.216	.242	.300	.336
3½	.226	.253	.318	.356
4	.237	.265	.337	.377
5	.258	.289	.375	.420
6	.280	.314	.432	.484
8	.322	.361	---	---
10	.365	.409	---	---
12	.406	.455	---	---

3.5. Workmanship—The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform in color, opacity, density, and other physical properties.

3.6. Approval for potable water—All pipe intended for use with potable water shall meet the requirements for that purpose specified by the National Sanitation Foundation Testing Laboratory, Inc.[8], or specified by other organizations accredited by Federal or State Public Health agencies as having requirements for that purpose which are no less stringent than those of the National Sanitation Foundation Testing Laboratory, Inc.

[8] Address: The National Sanitation Foundation Testing Laboratory, Inc., 2355 West Stadium Boulevard, Ann Arbor, Michigan 48106.

TABLE 4a. *Sustained pressure test conditions for water at 23° C (73.4° F) for PE plastic pipe, Schedules 40 and 80*

Nominal pipe size	Pressure [a] required for test					
	PE2306, PE3306 and PE3406		PE2305		PE1404	
	Sched. 40	Sched. 80	Sched. 40	Sched. 80	Sched. 40	Sched. 80
inch	*psi*	*psi*	*psi*	*psi*	*psi*	*psi*
½	390	560	310	440	240	350
¾	320	450	250	360	200	280
1	300	420	240	330	180	260
1¼	240	340	190	270	150	220
1½	220	310	170	250	140	190
2	180	270	140	210	120	160
2½	200	280	160	220	120	180
3	170	250	140	200	100	160
3½	160	230	130	180	100	140
4	150	210	120	170	90	130
5	130	190	100	150	80	120
6	120	180	90	140	70	120
8	100	---	80	---	65	---
10	90	---	70	---	55	---
12	85	---	70	---	55	---

[a] The fiber stresses (hoop stresses) used to derive these test pressures are as follows:
At 23° C (73.4° F), PE2306, PE3306, PE3406—1320 psi
PE2305—1050 psi
PE1404—820 psi

TABLE 4b. Sustained pressure test conditions for water at 37.8° C (100° F) *for PE plastic pipe, Schedules 40 and 80*

Nominal pipe size	Pressure [a] required for test					
	PE2306, PE3306 and PE3406		PE2305		PE1404	
	Sched. 40	Sched. 80	Sched. 40	Sched. 80	Sched. 40	Sched. 80
inch	*psi*	*psi*	*psi*	*psi*	*psi*	*psi*
½	320	450	250	360	170	240
¾	260	370	200	290	140	200
1	240	340	190	270	130	180
1¼	200	280	160	220	100	150
1½	180	250	140	200	90	130
2	150	220	120	170	85	110
2½	160	230	130	180	85	120
3	140	200	110	160	75	100
3½	130	180	100	150	70	100
4	120	170	90	140	60	90
5	100	160	85	120	55	80
6	90	150	75	120	50	80
8	80	---	65	---	45	---
10	75	---	60	---	40	---
12	70	---	55	---	40	---

[a] The fiber stresses (hoop stresses) used to derive these test pressures are as follows:
At 37.8° C (100° F) PE2306, PE3306, PE3406—1070 psi
PE2305— 850 psi
PE1404— 570 psi

TABLE 5. *Burst pressure requirements for water at 23 °C (73.4 °F) for PE plastic pipe, Schedules 40 and 80*

Nominal pipe size	Minimum burst pressures [a]					
	PE2306, PE3306 and PE3406		PE2305		PE1404	
	Sched. 40	Sched. 80	Sched. 40	Sched. 80	Sched. 40	Sched. 80
inch	*psi*	*psi*	*psi*	*psi*	*psi*	*psi*
½	750	1070	600	850	370	530
¾	600	870	480	690	300	430
1	570	790	450	630	280	390
1¼	460	650	370	520	230	320
1½	420	590	330	470	200	290
2	350	510	280	400	170	250
2½	380	540	300	420	190	260
3	330	470	260	370	160	230
3½	300	430	240	340	150	210
4	280	410	220	320	140	200
5	240	360	190	290	120	180
6	220	350	170	280	110	170
8	200	---	150	---	100	---
10	180	---	140	---	90	---
12	170	---	130	---	80	---

[a] The fiber stresses (hoop stresses) used to derive these test pressures are as follows:
PE2306, PE3306, PE3406—2520 psi
PE2305—2000 psi
PE1404—1250 psi

4. INSPECTION AND TEST PROCEDURES

4.1. Test conditions—Tests shall be conducted in a standard laboratory atmosphere of 23 ±2° C (73.4 ±3.6° F) and 50 ±5 percent relative humidity.

4.2. Conditioning test specimens—The test specimens shall be conditioned at 23 ±2° C (73.4 ±3.6°F) and 50 ±5 percent relative humidity for not less than 48 hours prior to test in accordance with Procedure A in ASTM D618–61, *Standard Methods of Conditioning Plastics and Electrical Insulating Materials for Testing*,[9] unless otherwise specified in this Standard.

4.3. Dimensions—Measurements shall be made in accordance with ASTM D2122–67, *Standard Method of Determining Dimensions of Thermoplastic Pipe*.[9]

4.3.1. Outside diameter—The outside diameter of the pipe shall be measured with a tapered sleeve gage in accordance with section 6 of ASTM D2122–67.

4.3.2. Wall thickness—Micrometer measurements of the wall thickness shall be made in accordance with section 4 of ASTM D2122–67 to determine the maximum and minimum values. The wall thickness shall be measured at both ends of the pipe to the nearest 0.001 inch.

4.3.3. Wall thickness range—The measurements shall be made in a manner such that the maximum, A, and the minimum, B, wall thicknesses of each cross section measured are obtained.

[9] See footnotes 2 and 3, page 1.

The wall thickness range, E, shall be calculated for each cross section as follows:

$$E, \%, = \frac{A-B}{A} \times 100$$

The wall thickness range shall not exceed 12 percent for any cross section measured.

4.4. Density—The density of the pipe compound shall be determined in accordance with ASTM D1505–68, *Standard Method of Test for Density of Plastics by the Density-Gradient Technique,*[10] or ASTM D792–66, *Standard Methods of Test for Specific Gravity and Density of Plastics by Displacement,*[10] using three specimens. The percent of carbon black by weight shall be determined in accordance with 4.9. The density of the PE base resin (uncolored PE) in the pipe compound shall be calculated as follows:

Density of resin in g/cm^3 = Density of pipe compound in g/cm^3 minus (0.0044 × % of carbon black by weight).

4.5. Sustained pressure test—Twelve specimens of pipe, each bearing the required permanent marking, shall be tested. The length of each specimen shall be at least 10 times the nominal diameter of pipe with the exception that no specimen shall be less than 10 inches or more than 3 feet between end closures. Six specimens shall be tested at 37.8° C (100° F) under the pressures established in table 4b; and the remaining six specimens shall be tested at 23° C (73.4° F) under the pressures established in table 4a. The specimens shall be conditioned for at least two hours prior to the test in an atmosphere which is held to within ±2° C (±3.6° F) of the specified test temperatures. The temperature of the water during the test shall be maintained within ±2° C (±3.6° F) of the specified temperature. The test shall be in accordance with ASTM D1598–67, except that the pressure shall be maintained at the values given in table 4 for 1,000 hours.. Pressure shall be held as closely as possible, but within ±10 psi. Failure of any two of the six specimens tested at a given temperature shall constitute noncompliance with this Standard.

Failure of one of the six specimen tested at a given temperature will require a test of six additional specimens at that temperature. The failure of one of the six specimens evaluated in the retest shall constitute noncompliance with this Standard. Evidence of failure of the pipe shall be as defined in section 4, ASTM D1598–67, as follows:

Failure—Any continuous loss of pressure resulting from the transmission of the test liquid through the body of the specimen under test.

Ballooning—Any abnormal localized expansion of a pipe specimen while under internal hydraulic pressure.

Bursting—Failure by a break in the pipe with immediate loss of test liquid and continued loss at essentially no pressure.

Seepage or weeping—Failure that occurs through essentially

[10] See footnotes 2 and 3, page 1.

microscopic breaks in the pipe wall, frequently only at or near the test pressure. At lower pressures the pipe may carry liquids without evidence of loss of the liquids.

4.6. Burst pressure—The minimum burst pressure shall be determined with at least five specimens in accordance with ASTM D1599–62T, *Tentative Method of Test for Short-Time Rupture Strength of Plastic Pipe, Tubing, and Fittings.*[11] The time of testing to failure for each specimen shall be between 60 and 90 seconds. This test may be made at other than the standard test temperature, 23 ± 2° C (73.4 ± 3.6° F), in which case the minimum burst pressure requirements shall be adjusted in accordance with the conversion factor or the equations given in table 6. In case of disagreement, the standard test temperature shall be used.

TABLE 6. *Conversion [a] of burst pressure requirements for Schedules 40 and 80 plastic pipe table 5 to equivalent burst pressures at other temperatures*

Test Temperature		Conversion Factor, r
C	F	
10.0	(50)	1.18
12.9	(55)	1.14
15.6	(60)	1.10
18.3	(65)	1.06
21.1	(70)	1.03
23.0	(73.4)	1.00
23.9	(75)	0.98
26.7	(80)	.92
29.4	(85)	.87
32.2	(90)	.81
35.0	(95)	.75
37.8	(100)	.70

[a] The equations relating temperature to the conversion factor are as follows:

Celsius (Centigrade) Scale	Fahrenheit Scale
Above 23.0°, $T_C = 72-49r$	Above 73.4°, $T_F = 162-88.6r$
Below 23.0°, $T_C = 95-72r$	Below 73.4°, $T_F = 207-133.6r$

When r is calculated it shall be rounded off to the nearest 0.01.

4.7. Environmental stress cracking test—Six randomly selected 10-inch-long specimens containing the permanent marking (see 6.1) shall be used for this test. One end of each specimen shall be connected to a 400-psi pressure gage and the other end shall be connected to an air or nitrogen supply through a suitable valve. The specimens shall be subjected to the pressures listed in table 4a for 23° C and then the valve closed and disconnected in such a manner that the pressure is retained in the specimen. Enough pressure in excess of the listed value shall be applied to compensate for the pressure lost during disconnection of the pressure source. The assembly shall be tested for leaks by immersion in water. Leaks shall be eliminated or nonleaking specimens substituted for those that leak. Care shall be taken to completely dry the test specimen and then a coating of IGEPAL

[11] See footnotes 2 and 3, page 1.

CO 630 [12], or equal, shall be applied to the pipe surface with a brush. Care shall be taken to keep the IGEPAL at least one-half inch but not more than one inch away from the clamps used on each end of the pipe. Fresh reagent shall be used for each test and care shall be taken to store reagent in closed containers because it is hygroscopic. The coated pipe assembly shall be kept at room temperature for three hours and then examined. There shall be no loss of pressure in at least four of the six specimens. Specimens that leak at a connection shall be discarded and retests made. Loss of pressure caused by expansion of the pipe shall not be cause for rejection.

4.8. Carbon black—The carbon black content of the pipe, or of the outer layer of pipe produced by simultaneous multiple extrusion, shall be determined in accordance with ASTM D1603–68, *Standard Method of Test for Carbon Black in Ethylene Plastics*.[13]

5. DEFINITIONS

5.1. General—Definitions and abbreviations are in accordance with ASTM D883–69, *Standard Nomenclature Relating to Plastics*;[13] ASTM D1600–69, *Standard Abbreviations of Terms Relating to Plastics*;[13] and Plastics Pipe Institute,[14] Technical Report PPI-TRI-NOV 1968, *A Glossary of Plastics Piping Terms*.[15]

5.1.1. Hydrostatic design stress—The estimated maximum tensile stress in the wall of the pipe in the circumferential orientation due to internal hydrostatic water pressure that can be applied continuously with a high degree of certainty that failure of the pipe will not occur.

5.1.2. Pressure rating (PR)—The estimated maximum pressure that water in the pipe can exert continuously with a high degree of certainty that failure of the pipe will not occur.

5.1.3. Relation between dimensions, design stress, and pressure rating—The following expression, commonly known as the ISO equation (see ISO R161–1960, *Pipes of Plastic Materials for the Transport of Fluids*),[15, 16] is used in this Products Standard to relate dimensions, design stress, and pressure rating:

$$\frac{2S}{P} = \frac{OD}{t} - 1$$

Where S = design stress, psi
P = pressure rating, psi
OD = average outside diameter, inches
t = minimum wall thickness, inches

5.1.4. Standard thermoplastic pipe materials designation code—The pipe materials designation code consists of the abbreviation

[12] The use of the name IGEPAL CO 630 is solely for the purpose of description and other products equal in performance will be acceptable. IGEPAL CO 630 may be obtained from the General Aniline and Film Corporation, Dyestuff and Chemical Division, 140 West 51st Street, New York, New York 10020.
[13] See footnotes 2 and 3, page 1.
[14] A division of The Society of the Plastics Industry, 250 Park Avenue, New York, New York 10017.
[15] See footnote 3, page 1.
[16] See footnote 5, page 2.

PE for the type of plastic, followed by the ASTM materials designations (Arabic numerals) and the design stress in units of 100 psi with any decimal figures dropped. When the design stress code contains less than two figures, a zero is used before the number. Thus a complete material code consists of two letters and four figures. See 2.2.1.3.

6. MARKING

6.1. Mandatory marking—Marking on the pipe shall include the following, spaced at intervals of not more than five feet:

(1) The nominal pipe size (e.g., 2″).

(2) The type of plastic pipe material in accordance with the designation code (e.g., PE2305).

(3) Schedule size (40 or 80, whichever is applicable) and the the pressure rating in psi for water at 23° C (73.4° F) shown as the number followed by psi (e.g., 100 psi). When the indicated pressure rating is lower than that calculated in accordance with 5.1.3. (see 2.2.2) this shall be indicated by placing a star after the pressure rating.

(4) This Product Standard designation PS **12–69.**

(5) The manufacturer's name (or trademark) and code.

(6) Pipe intended for use with potable water shall include the seal of approval (or "nSf" mark) of the National Sanitation Foundation Testing Laboratory, Inc., or some other testing laboratory accredited by Federal or State Public Health agencies. (See 3.6.) This marking shall be spaced at intervals required by the organization establishing the specifications.[17]

7. IDENTIFICATION

7.1. Labels and literature—In order that purchasers may identify products complying with the requirements of this voluntary Product Standard, producers choosing to produce such products in compliance with this voluntary Standard may include a statement in conjunction with their name and address on labels, invoices, sales literature, and the like. The following statement is suggested when sufficient space is available:

> This polyethylene plastic pipe conforms to the requirements established in Product Standard PS 12–69, developed cooperatively with the industry and published by the National Bureau of Standards under the voluntary Product Standards procedures of the U.S. Department of Commerce. Full responsibility for the conformance of this product with the standard is assumed by (name and address of producer or distributor).

The following abbreviated statement is suggested when available space on labels is insufficient for the full statement:

Conforms to PS 12–69, (name and address of producer or distributor).

[17] Manufacturers using the seal of approval of an accredited testing laboratory must obtain authorization from the laboratory concerned.

8. HISTORY

8.1. On July 11, 1967, approval was granted to process in accordance with the *Procedures for the Development of Voluntary Product Standards* a new Product Standard for polyethylene plastic pipe when made in Schedule 40 and 80 sizes with controlled outside diameter dimensions. The proposed new Standard was submitted to the National Bureau of Standards by the Plastics Pipe Institute of the Society of the Plastics Industry, Inc.

With unanimous approval of its Standard Review Committee, public announcement was made and the recommended Product Standard was widely circulated on November 12, 1968, for consideration and acceptance. The response to this circulation recorded sufficient acceptance from producers, distributors, and users of polyethylene plastic pipe to indicate success of the project.

Accordingly, in February 1969 PS 12–69, *Polyethylene (PE) Plastic Pipe (Schedules 40 and 80—Outside Diameter Dimensions)*, was announced to become effective on March 1, 1969.

Technical Standards Coordinator: Herbert A. Philo, Product Standards Section, Office of Engineering Standards Services, National Bureau of Standards, Washington, D.C. 20234.

9. STANDING COMMITTEE

9.1. The following individuals comprise the membership of the Standing Committee which is to review all revisions proposed to keep this Standard abreast of progress. Comments concerning the Standard and suggestions for revision may be addressed to any member of the committee or to the Office of Engineering Standards Services, National Bureau of Standards, U.S. Department of Commerce, which acts as secretary for the committee.

Representing Producers

Frank J. Furno (Chairman), Celanese Plastics Company, 142 Parsons Avenue, Columbus, Ohio 43215

John J. Lainson, Western Plastics Corporation, 1515 West Second Street, Hastings, Nebraska 68901

Frank W. Reinhart, Plastics Pipe Institute, 9918 Sutherland Road, Silver Spring, Maryland 20901

Jeryl H. Zirkelbach, Cresline Plastic Pipe Company, Inc., 955 Diamond Avenue, Evansville, Indiana 47717

Paul F. Finn, Arizona Plastics Extrusion Company, 2547 West Jackson Street, Phoenix, Arizona 85009

Representing Distributors

W. K. Klein, Joseph T. Ryerson & Son, Inc., Post Office Box 8000–A, Chicago, Illinois 60680

Eugene J. Linsky, Tampa Wholesale Plumbing Supply Corporation, 205 Brush Street, Tampa, Florida 33606

H. W. Pinson, Beck and Gregg Hardware Company, 217 Luckie Street, Atlanta, Georgia 30303

Harold Stein, Torrington Supply Company, Inc., 125 Maple Street, Waterbury, Connecticut 06720

Representing Users

Byron R. Eplett, National Association of Plumbing-Heating-Cooling Contractors, 544 Grove Avenue, Johnstown, Pennsylvania 15902

Euclid Faneuf, Whirlpool Corporation, Whirlpool Research and Engineering Center, Monte Road, Benton Harbor, Michigan 49022

C. S. Perkins, Union Oil Company of California, Union Oil Center, Los Angeles, California 90017

C. B. F. Young, Cracker Asphalt Corporation, Post Office Box Drawer 775, Douglasville, Georgia 30134

General Interest

R. N. Bowen, National Sanitation Foundation Testing Laboratory, Inc., 2355 West Stadium Boulevard, Ann Arbor, Michigan 48106

Robert E. Lyons, General Services Administration, Federal Supply Service, Standardization Division, Washington, D.C. 20405

W. K. Rodman, Department of Housing and Urban Development, Federal Housing Administration, Washington, D.C. 20411

G. C. Sherlin, Building Research Division, National Bureau of Standards, Washington, D.C. 20234

10. ACCEPTORS

10.1. The manufacturers, distributors, users, and others listed below have individually indicated in writing their acceptances of this Product Standard prior to its publication. The acceptances indicate an intention to utilize the Standard as far as practicable, reserving the right to depart from it as may be deemed advisable. The list is published to show the extent of recorded public support for the Standard.

ASSOCIATIONS
(General Support)

American Institute of Supply Associations, Inc., Washington, D.C.
Central Supply Association, Chicago, Illinois
Mobile Homes Manufacturers Association, Chicago, Illinois
National Building Material Distributors Association, Chicago, Illinois
National Sanitation Foundation, Ann Arbor, Michigan
Plastics Pipe Institute, New York, New York

PRODUCERS

Anesite Division, Clow Corporation, Chicago, Illinois
Arizona Plastics Extrusion Company, Phoenix, Arizona
Busada Manufacturing Corporation, Flushing, New York
Carlon Products Division of Continental Oil Company, Aurora, Ohio
Celanese Plastics Company, Hilliard, Ohio
Continental Plastics Industries, Inc., Denver, Colorado
Crealine Plastic Pipe Company, Inc., Evansville, Indiana
Crown-Line Plastics, Inc., Hamburg, Iowa
Electric Hose and Rubber Company, Wilmington, Delaware
Flintkote Company, The, Orangeburg, New York
Four D Manufacturing Company, Glenville, West Virginia
Glamorgan Pipe and Foundry Company, Lynchburg, Virginia
Goodall Rubber Company, Trenton, New Jersey
Kerona Plastic Extrusion Company, Stockton, California
Moore Plastic Industries, Inc., Los Angeles, California
Moore Manufacturing Inc., Brisbane, California
Nebraska Plastics, Inc., Cozad, Nebraska
Olin Evanite Plastics, Penacook, New Hampshire
Phillips Products Company, Inc., Bartlesville, Oklahoma
Portco Corporation, Vancouver, Washington
Sedco Corporation, Auburndale, Florida
Simpson Timber Company, Eugene, Oregon
Taylor Plastics, Inc., Howell, Michigan
Vistron Corporation, Plastex Division, Columbus, Ohio
Western Plastics Corporation, Hastings, Nebraska

FIRMS AND OTHER INTERESTS

Aetna Engineering Company, Ashaway, Rhode Island
Allied Chemical Corporation, Morristown, New Jersey
Amoco Chemical Corporation, Stow, Ohio
Anderson, Ted. D., Company, Kokomo, Indiana
Ashton, Brazier, Montmorency and Associates, Architects, Salt Lake City, Utah
Barclay, Ayers and Bertsch Company, Grand Rapids, Michigan
Beible's Pump and Supply, Inc., Emmaus, Pennsylvania
Belli and Belli, Architects, Chicago, Illinois
Berg Construction Company, Inc., Juneau, Alaska
Bogina and Associates, Consulting Engineers, Lenexa, Kansas
Camlet, J. Thomas and Son, Architects and Engineers, Clifton, New Jersey
Cannon and Mullen, Architects, Salt Lake City, Utah
Can-Tex Plastics, Mineral Wells, Texas
Colonial Plastics, Tampa, Florida
Columbia Gas of Ohio, Inc., Columbus, Ohio
Cracker Asphalt Corporation, Douglasville, Georgia
Federal Corporation, Oklahoma City, Oklahoma
Forsythe, Bergemann, and Vanek, Architects, Canton, Ohio
Garden State Wholesale, Inc., Camden, New Jersey
Genova Products, Davison, Michigan
Kathan and Son, General Contractors, Inc., Onalaska, Wisconsin
Kemp, Bunch, and Jackson, Architects, Jacksonville, Florida
Kendall, J. B., Company, Washington, D.C.
Melbourne, George F. S. and Associates, Canton, Ohio
Madsen and Howell, Inc., Perth Amboy, New Jersey
M & H Rubber and Supply Inc., Perth Amboy, New Jersey
Panhandle Eastern Pipe Line Company, Kansas City, Missouri
Plastiline, Inc., Pompano Beach, Florida
Ryerson, Joseph T. and Son, Inc., Chicago, Illinois
Sears, Roebuck and Company, Chicago, Illinois
Shamban, W. S., and Company, Los Angeles, California
Sinclair-Koppers Company, Monaca, Pennsylvania
Sloane, R. and G., Manufacturing Division, Sun Valley, California
Sutton Supply, Inc., Portland, Maine
Swanson Company, The, Fresno, California
Tampa Wholesale Plumbing Supply Corporation, Tampa, Florida
Union Carbide Corporation, New York, New York
United Pipe and Supply Company, Inc., Eugene, Oregon
United States Steel Corporation, Pittsburgh, Pennsylvania
Wank, Adams and Slavin, Office of Fellheimer and Wagner, New York, New York

GOVERNMENT

Agriculture, Department of, Washington, D. C.
Arizona State Department of Health, Phoenix, Arizona
General Services Administration, Washington, D.C.
Housing and Urban Development, Department of, Washington, D.C.
National Park Service, USDI, Washington, D.C.
Navy, Department of the, Naval Ship Systems Command, Annapolis, Maryland