

DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
OFFICE OF STANDARDS SERVICES

COMMERCIAL STANDARD CS256-63

POLYVINYL CHLORIDE) (PVC) PLASTIC PIPE
(SDR-PR AND CLASS T)

Product Standard PS22-70, Poly (Vinyl Chloride) (PVC) Plastic Pipe (Standard Dimension Ratio), [supersedes CS256-63, Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR and Class T)], was withdrawn by the Department of Commerce on September 9, 1974.

This product standard was replaced by ASTM D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

This ASTM standard is under the direct responsibility of Subcommittee F17.25 on Vinyl Based Pipe. The Committee Staff Manager for Committee F17 on Plastic Piping Systems can provide assistance, information, and contacts for the subcommittee.

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**Polyvinyl Chloride (PVC) Plastic Pipe
(SDR-PR and Class T).**

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A recorded
voluntary standard of the
trade published by
the U.S. Department
of Commerce



**U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS**

Office of Commodity Standards

EFFECTIVE DATE

Having been passed through the regular procedures of the Office of Commodity Standards (formerly the Commodity Standards Division, Office of Technical Services; transferred to the National Bureau of Standards July 1, 1963), and approved by the acceptors hereinafter listed, this Commercial Standard is issued by the U.S. Department of Commerce, effectively July 1, 1963.

LUTHER H. HODGES, *Secretary.*

COMMERCIAL STANDARDS

Commercial Standards are developed by manufacturers, distributors, and users in cooperation with the Office of Commodity Standards of the National Bureau of Standards. Their purpose is to establish quality criteria, standard methods of test, rating, certification, and labeling of manufactured commodities, and to provide uniform bases for fair competition.

The adoption and use of a Commercial Standard is voluntary. However, when reference to a Commercial Standard is made in contracts, labels, invoices, or advertising literature, the provisions of the standard are enforceable through usual legal channels as a part of the sales contract.

Commercial Standards originate with the proponent industry. The sponsors may be manufacturers, distributors, or users of the specific product. One of these three elements of industry submits to the Office of Commodity Standards the necessary data to be used as the basis for developing a standard of practice. The office by means of assembled conferences or letter referenda, or both, assists the sponsor group in arriving at a tentative standard of practice and thereafter refers it to the other elements of the same industry for approval or for constructive criticism that will be helpful in making any necessary adjustments. The regular procedure of the office assures continuous servicing of each Commercial Standard through review and revision whenever, in the opinion of the industry, changing conditions warrant such action.

SIMPLIFIED PRACTICE RECOMMENDATIONS

Under a similar procedure the Office of Commodity Standards cooperates with industries in the establishment of Simplified Practice Recommendations. Their purpose is to eliminate avoidable waste through the establishment of standards of practice for sizes, dimensions, varieties, or other characteristics of specific products; to simplify packaging practices; and to establish simplified methods of performing specific tasks.

The initial printing of CS256-63 was made possible through the cooperation of The Plastics Pipe Institute, A Division of The Society of the Plastics Industry, Inc.

Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR and Class T).

[Effective July 1, 1963]

1. PURPOSE

1.1 The purpose of this Commercial Standard is (a) to establish, on a national basis, standard dimensions, water pressure ratings, and other significant quality requirements for polyvinyl chloride (PVC) plastic pipe, (b) to inform producers, distributors, engineers, code officials, and users about some of the qualities of this product, (c) to assist buyers and vendors in obtaining and vending quality merchandise, and (d) to promote understanding concerning commercially available PVC plastic pipe among all these groups.

2. SCOPE

2.1 The PVC pipe covered in this Commercial Standard is made in standard thermoplastic pipe dimension ratios and is pressure rated for water. Included are criteria for classifying PVC plastic pipe materials and PVC plastic pipe, a system of nomenclature for PVC plastic pipe, and requirements and methods of test for materials, workmanship, dimensions, pressure rating, sustained pressure, burst pressure, flattening, chemical resistance, and extrusion quality. Methods of marking and practices for indicating compliance with this standard are also given.

3. DEFINITIONS

3.1 **General.**—Definitions are in accordance with Definitions of Terms Relating to Plastic (ASTM Designation: D883-62T) and abbreviations are in accordance with Abbreviations of Terms Relating to Plastics (ASTM Designation: D1600-60T), unless otherwise indicated. The abbreviation for polyvinyl chloride plastic is PVC.

3.2 **Standard thermoplastic pipe dimension ratio (SDR).**—SDR is the ratio of pipe diameter to wall thickness. For PVC pipe it is calculated by dividing the average outside diameter of the pipe in inches by the minimum wall thickness in inches. If the wall thickness calculated by this formula is less than 0.060 inch, it shall be arbitrarily increased to 0.060 inch.

3.3 **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.

3.4 **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.

3.5 Relation between standard dimension ratio, 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), is used in this Commercial Standard to relate standard dimension ratio, design stress and pressure rating:

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

where S=design stress, p.s.i.

P=pressure rating, p.s.i.

OD=average outside diameter, inches

t=minimum wall thickness, inches

SDR=standard thermoplastic pipe dimension ratio (OD/t for PVC pipe).

3.6 Standard thermoplastic pipe materials designation code.—The pipe materials designation code shall consist of the abbreviation PVC for the type of plastic, followed by the ASTM type and grade in Arabic numerals and the design stress in units of 100 psi with any decimal figures dropped. When the design stress code contains less than 2 figures, a cipher is used before the number. Thus a complete material code consists of 3 letters and 4 figures for PVC plastic pipe materials. (See sec. 4.)

3.7 ASTM.—This abbreviation refers to standards issued by the American Society for Testing and Materials, 1916 Race Street, Philadelphia 3, Pa.

3.8 PPI.—This abbreviation refers to the Plastics Pipe Institute, A Division of The Society of the Plastics Industry, 250 Park Avenue, New York 17, N.Y.

4. MATERIALS REQUIREMENTS

4.1 General.—PVC plastics used to make pipe meeting the requirements of this standard are categorized by means of two criteria, namely, (a) short-term strength tests and (b) long-term strength tests.

4.2 Basic materials.—This standard covers PVC pipe made from four PVC plastics as defined in Specification for Rigid Polyvinyl Chloride Compounds (ASTM Designation: D1784-60T) in which the requirements are based on short-term tests. These are Type I, Grade 1; Type I, Grade 2; Type II, Grade 1; and Type IV, Grade 1.¹

4.3 Hydrostatic design stresses.—This standard covers PVC pipe made from PVC plastics as defined by three hydrostatic design stresses which have been assigned on the basis of long-term tests.² These hydrostatic design stresses are 2,000, 1,600, and 1,000 psi for water at 23° C (73.4° F). These hydrostatic design stresses apply only to pipe meeting all of the requirements of this Commercial Standard.

4.4 Pipe materials.—This standard covers four PVC pipe materials as follows:

(1) Type I, Grade 1, with a hydrostatic design stress of 2,000 psi for water at 23° C (73.4° F), designated as PVC1120.

¹ This grade is tentatively assigned in this standard pending the addition of this material to ASTM D1784.

² Information regarding the method of test and other criteria used in developing these hydrostatic design stresses may be obtained from the PPI.

(2) Type I, Grade 2, with a hydrostatic design stress of 2,000 psi for water at 23° C (73.4° F), designated as PVC1220.

(3) Type II, Grade 1, with a hydrostatic design stress of 1,000 psi for water at 23° C (73.4° F), designated as PVC2110.

(4) Type IV, Grade 1, with a hydrostatic design stress of 1,600 psi for water at 23° C (73.4° F), designated as PVC4116.

4.5 Compound.—The PVC plastic extrusion compound shall meet the requirements of Type I, Grade 1; Type I, Grade 2; Type II, Grade 1; or Type IV, Grade 1³ as described in ASTM D1784-60T.

4.6 Rework material.—Clean, rework material, generated from the manufacturer's own pipe production, may be used by the same manufacturer so long as the pipe produced is equal in quality to pipe extruded from virgin material.

5. PIPE CLASSIFICATION

5.1 General.—This Commercial Standard covers PVC pipe made from four PVC plastic pipe materials in seven standard dimension ratios and nine water pressure ratings for nonthreaded pipe and in one class (Class T) for pipe intended for threading.

5.2 Standard dimension ratio pipe.—This standard covers PVC pipe in seven standard dimension ratios, namely, 13.5, 17, 21, 26, 32.5, 41, and 64, which are uniform for all nominal pipe sizes for each material and pressure rating. These are referred to as SDR13.5, SDR17, SDR21, SDR26, SDR32.5, SDR41, and SDR64, respectively. The pressure rating is uniform for all nominal pipe sizes for a given PVC pipe material and SDR (see Table 1).

5.3 Class T pipe.—This standard covers PVC pipe intended for threading, designated as Class T. The pressure ratings vary with the pipe size and the material as shown in Table 2. These ratings are one-half those for nonthreaded pipe in the same material and dimension. These pressure ratings are used with a T after the value; e.g., 100T psi.

5.4 Pressure rating (PR).—The pipe shall be rated for use with water at 23° C (73.4° F) at the maximum internal pressures shown in Tables 1 and 2. Lower pressure ratings than those calculated in accordance with paragraph 3.5 may be recommended, at the option of the pipe manufacturer, in which case the SDR shall be included in the marking. Experience of the industry indicates that PVC plastic pipe meeting the requirements of this standard gives satisfactory service under normal conditions for a long period at these pressure ratings.² The sustained pressure requirements (6.3) are related to these ratings through the slopes of the strength-time plots of these materials in pipe form.

6. REQUIREMENTS

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

See footnote 2 on p. 4.

³ Mechanical strength, heat resistance, flammability; and chemical resistance properties are covered in ASTM D1784.

6.2. Pipe dimensions and tolerances.

6.2.1 **Outside diameters.**—The outside diameters and tolerances shall be as shown in Table 3 when measured in accordance with paragraphs 7.4 and 7.4.1.

6.2.2 **Wall thickness.**—The wall thicknesses and tolerances shall be as shown in Table 4 when measured in accordance with paragraphs 7.4 and 7.4.2.

6.2.3 **Eccentricity.**—The eccentricity of the inside and outside circumferences of the pipe walls shall be within 12% when measured in accordance with paragraphs 7.4 and 7.4.3.

6.3 **Sustained pressure.**—The pipe shall not fail, balloon, burst, or weep as defined in Test for Time-to-Failure of Plastic Pipe Under Long-Term Hydrostatic Pressure (ASTM Designation: D1598-63T, Section 4) at the test pressures given in Table 5 when tested in accordance with paragraph 7.5.

6.4 **Burst pressure.**—The minimum burst pressures for PVC plastic pipe shall be as given in Table 6, when determined in accordance with paragraph 7.6.

6.5 **Flattening.**—There shall be no evidence of splitting, cracking or breaking when the pipe is tested in accordance with paragraph 7.7.

6.6 **Extrusion quality.**—The pipe shall not flake or disintegrate when tested in accordance with paragraph 7.8. This requirement is not applicable to PVC 4116.

6.7 **Approval for potable water.**—All pipe intended for use with potable water shall meet the specifications of the National Sanitation Foundation Testing Laboratories, Inc., or other accredited testing laboratories recognized by Public Health officials. These specifications require that the pipe shall be manufactured of virgin PVC plastic, that no scrap material shall be used, and that it is satisfactory for transporting potable water.⁴

7. TEST METHODS

7.1 **Conditioning test specimens.**—The test specimens shall be conditioned at $23^{\circ}\pm 1^{\circ}$ C ($73.4^{\circ}\pm 1.8^{\circ}$ F) and 50 ± 2 percent relative humidity for not less than 48 hours prior to test in accordance with Procedure A in Standard Method of Conditioning Plastics and Electrical Insulating Materials for Testing (ASTM Designation: D618-58) for those tests where conditioning is required and in all cases of disagreement.

7.2 **Test conditions.**—Tests shall be conducted in the standard laboratory atmosphere of $23^{\circ}\pm 1^{\circ}$ C ($73.4\pm 1.8^{\circ}$ F) and 50 ± 2 percent relative humidity, unless otherwise specified in the test methods or in this Commercial Standard.

7.3 **Sampling.**—A sample of the pipe sufficient to determine conformance with this standard shall be taken at random.

7.4 **Dimensions.**—Any length of pipe may be used to determine the dimensions. Measurements shall be made in accordance with Method of Determining Dimensions of Thermoplastic Pipe (ASTM Designation: D2122-62T).

⁴ Manufacturers should obtain information on conditions for approval from the National Sanitation Foundation Testing Laboratories, Inc., School of Public Health, University of Michigan, Ann Arbor, Mich., or other accredited laboratory.

7.4.1 Outside diameter.—The outside diameter of the pipe shall be measured in accordance with Section 7 of D2122-62T. The average outside diameter at any cross section on the length of the pipe is the arithmetic average of the maximum and minimum diameters at that section. The average outside diameter of the pipe is the arithmetic mean of the average diameters at all measured cross sections. The tolerances for out-of-roundness shall apply only on pipe prior to shipment.

7.4.2 Wall thickness.—Micrometer measurements of the wall thickness shall be made in accordance with Section 4 of D2122-62T, 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.

7.4.3 Eccentricity.—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. The eccentricity, E, shall be calculated for each cross-section as follows:

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

The eccentricity shall not exceed 12 percent for any cross-section measured.

7.5 Sustained pressure test.—The test specimens shall be selected at random. Six specimens of pipe, each specimen at least 10 times the nominal diameter in length, but not less than 10 inches or more than three feet between end closures and bearing the permanent marking on the pipe, shall be tested individually with water at the internal pressures given in Table 5. The specimens shall be maintained at the pressure indicated for a period of 1,000 hours. Pressure shall be held as closely as possible, but within ± 10 psi. Specimens shall be conditioned at the test temperature of 23° C (73.4° F) to within $\pm 2^\circ$ C ($\pm 3.6^\circ$ F). The test shall be in accordance with Method of Test for Time-to-Failure of Plastic Pipe Under Long-Term Hydrostatic Pressure (ASTM Designation: D1598-63T), except that the pressure shall be maintained at the values given in Table 5 for 1,000 hours. Failure of two of the six specimens tested shall constitute failure in the test. Failure of one of the six specimens tested is cause for re-test of six additional specimens. Failure of one of the six specimens tested in re-test shall constitute failure in the test. Evidence of failure of the pipe shall be as defined in ASTM D1598-63T, Section 4, namely:

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

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

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

7.5.4 Seepage or weeping.—Failure that occurs through essentially 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.

7.6 Burst pressure.—The minimum burst pressure shall be determined with at least 5 specimens in accordance with Tentative Method for Short-Time Rupture of Thermoplastic Pipe, Tubing, and Fittings

(ASTM Designation D1599-62T). The time of testing each specimen shall be between 60 and 90 seconds.

7.7 Flattening.—Three specimens of the pipe, two inches long, shall be flattened between parallel plates in a suitable press until the distance between the plates is 40 percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within two to five minutes. On removal of the load the specimens shall be examined for evidence of splitting, cracking, or breaking.

7.8 Extrusion quality.—This procedure is used for determining the extrusion quality of PVC plastic pipe as indicated by reaction to immersion in anhydrous acetone. It is applicable only for distinguishing between unfused and properly fused PVC.

7.8.1 Apparatus.

(a) Acetone, American Chemical Society Reagent Grade, having a maximum density of 25° C of 0.7857 g/ml. The acetone shall be dried prior to use by shaking with anhydrous CaSO₄ or a commercial drying agent which is then removed by filtering.

(b) Individual sealed containers for each pipe specimen.

7.8.2 Specimens.—Specimens shall be of a size which is convenient to immerse in the sealed containers. For small-diameter pipe, the specimen shall be a short length of pipe. For large-diameter pipe, the specimen shall be a full pipe section, but it may be cut into smaller pieces to facilitate immersion. For pipe having a wall thickness greater than 0.125 inch, a portion of the wall at one point shall be removed so that approximately 1/16 inch remains. Removal shall be effected by filing, wet sanding, or other means which will prevent localized heating of the surface. Three randomly selected specimens shall constitute a sample of each lot of pipe or set of extrusion conditions.

7.8.3 Procedure.—Place sufficient anhydrous acetone in the container to insure a complete immersion of the specimen. Place the previously cut specimen in the container, seal it, and allow to stand for 20 minutes without agitation. The specimen shall be examined for initiation of flaking. Observations shall be made on the outside, inside, and on the sectioned surfaces revealing the mid-wall portion of the specimen.

8. MARKING AND DECLARATION OF COMPLIANCE

8.1 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 in paragraph 4.4; (e.g., PVC1120).
3. The standard thermoplastic pipe dimension ratio (or Class T, whichever is applicable) in accordance with the designation code in paragraph 5.2 (e.g., SDR21; Class T), or the pressure rating in psi for water at 23°C (73.4°F) shown as the number followed by psi (e.g., 200 psi; 200T psi), except that when intended for pressure application the pressure rating shall be shown (e.g., 200 psi; 200T psi). When the indicated pressure rating is lower than that calculated in accordance with paragraph 3.5 (see par. 5.4), the SDR shall also be included in the marking code.

4. The Commercial Standard designation CS256-63 with which the pipe complies.
5. The manufacturer's name (or trade mark) and code. It shall also include the seal of approval (or "nSf" mark) of the National Sanitation Foundation, or of some other accredited laboratory, spaced at intervals specified by the accredited laboratory for pipe intended for transporting potable water.⁵

8.2 Declaration of compliance.—To assure the purchasers that the PVC plastic pipe actually complies with all requirements of this Commercial Standard, it is recommended that manufacturers include the following statement in conjunction with their names and addresses on labels, invoices, sales literature, etc.

This PVC plastic pipe conforms to all requirements⁶ of Commercial Standard CS256-63, as developed by the trade under the Commodity Standards procedures, U.S. Department of Commerce.

TABLE 1. *Standard thermoplastic pipe dimension ratios (SDR) and water pressure ratings (PR) at 23° C (73.4° F) for nonthreaded¹ PVC plastic pipe*

Standard dimension ratio	PVC pipe materials ²		
	PVC1120 PVC1220	PVC4116	PVC2110
	Pressure rating, p.s.i.		
13.5	315	250	160
17	250	200	125
21	200	160	100
26	160	125	80
³ 32.5	125	100	63
⁴ 41	100	80	50
⁵ 64	63	50	⁶ NPR
Pressure rating	Standard dimension ratio		
p.s.i.	13.5	-----	-----
315	17	13.5	-----
250	21	17	-----
200	26	21	13.5
160	32.5	26	17
125	41	32.5	21
100	-----	41	26
80	64	-----	32.5
63	-----	64	41
50	-----	-----	-----

¹ These pressure ratings do not apply for threaded pipe. See table 2 for pressure ratings for threaded pipe.

² See pars. 3.6 and 4.4 for code designation.

³ Available only in nominal pipe size diameters of 3 to 12 inches.

⁴ Available only in nominal pipe size diameters of 3½ to 12 inches.

⁵ Available only in nominal pipe size diameters of 6 to 12 inches.

⁶ NPR=not pressure rated.

⁵ Manufacturers using the seal of approval (or "nSf" mark) of the National Sanitation Foundation Testing Laboratories, Inc. or other accredited laboratory must obtain authorization from the laboratory concerned.

⁶ Insert minimum marking code as described in paragraph 8.1 plus any additional information the manufacturer wishes to add here.

TABLE 2. Water pressure ratings at 23° C (73.4° F) for Class T PVC plastic pipe (threaded)

Nominal pipe size	Dimension ratio	Pressure ratings ¹ for PVC plastic pipe made from		
		PVC1120 PVC1220	PVC4116	PVC2110
<i>Inch</i>		<i>p.s.i.</i>	<i>p.s.i.</i>	<i>p.s.i.</i>
1/8	4.15	630	500	315
1/4	4.15	630	500	315
3/8	4.15	630	500	315
1/2	5.0	500	400	250
3/4	6.0	400	315	200
1	6.0	400	314	200
1 1/4	7.3	315	250	160
1 1/2	9.0	250	200	125
2	11.0	200	160	100
2 1/2	11.0	200	160	100
3	13.5	160	125	80
3 1/2	13.5	160	125	80
4	17.0	125	100	63
5	17.0	125	100	63
6	21.0	100	80	50
8	26.0	80	63	NPR
10	32.5	63	50	NPR
12	41.0	50	² NPR	NPR

¹ Pressure ratings for threaded pipe are one-half those calculated in accordance with 3.5. Thus, pressure ratings for nonthreaded pipe in Class T dimensions are twice those given in this table.

² NPR=not pressure rated.

TABLE 3. Outside diameters and tolerances for PVC plastic pipe

Pipe size	Average outside diameter	Tolerances		
		For average	For maximum and minimum (out-of-roundness)	
			SDR64 SDR41 SDR32.5 SDR26 SDR21	SDR17 SDR13.5 Class T
<i>inch</i>	<i>inch</i>	<i>inch</i>	<i>inch</i>	<i>inch</i>
1/8	0.405	±0.004	±0.015	±0.008
1/4	0.540	±0.004	±0.015	±0.008
3/8	0.675	±0.004	±0.015	±0.008
1/2	0.840	±0.004	±0.015	±0.008
3/4	1.050	±0.004	±0.015	±0.010
1	1.315	±0.005	±0.015	±0.010
1 1/4	1.660	±0.005	±0.015	±0.012
1 1/2	1.900	±0.006	±0.030	±0.012
2	2.375	±0.006	±0.030	±0.012
2 1/2	2.875	±0.006	±0.030	±0.012
3	3.500	±0.007	±0.030	±0.015
3 1/2	4.000	±0.008	±0.030	±0.015
4	4.500	±0.008	±0.050	±0.015
5	5.563	±0.009	±0.050	±0.015
6	6.625	±0.010	±0.050	±0.015
8	8.625	±0.011	±0.050	±0.030
10	10.750	±0.015	±0.050	±0.035
12	12.750	±0.015	±0.075	±0.045
		±0.015	±0.075	±0.050
		±0.015	±0.075	±0.060

TABLE 4. Wall thicknesses and tolerances for PVC plastic pipe

Nominal pipe size	Wall thickness ¹							
	SDR64		SDR41		SDR32.5		SDR26	
	Minimum	Tolerance	Minimum	Tolerance	Minimum	Tolerance	Minimum	Tolerance
<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>
1/2	-----	-----	-----	-----	-----	-----	-----	-----
3/4	-----	-----	-----	-----	-----	-----	0.060	+0.020
1	-----	-----	-----	-----	-----	-----	0.064	+0.020
1 1/4	-----	-----	-----	-----	-----	-----	0.073	+0.020
1 1/2	-----	-----	-----	-----	-----	-----	0.091	+0.020
2	-----	-----	-----	-----	-----	-----	0.110	+0.020
2 1/2	-----	-----	-----	-----	0.108	+0.020	0.135	+0.020
3	-----	-----	-----	-----	0.123	+0.020	0.154	+0.020
3 1/2	-----	-----	0.098	+0.020	0.138	+0.020	0.173	+0.021
4	-----	-----	0.110	+0.020	0.171	+0.021	0.214	+0.027
5	-----	-----	0.136	+0.020	0.204	+0.024	0.255	+0.031
6	0.104	+0.020	0.162	+0.020	0.265	+0.032	0.332	+0.040
8	0.135	+0.020	0.210	+0.025	0.331	+0.040	0.413	+0.050
10	0.168	+0.020	0.262	+0.031	0.392	+0.047	0.490	+0.059
12	0.199	+0.024	0.311	+0.037				

TABLE 4. Wall thicknesses and tolerances for PVC plastic pipe—Continued

Nominal pipe size	Wall thickness ¹							
	SDR21		SDR17		SDR13.5		Class T	
	Minimum	Tolerance	Minimum	Tolerance	Minimum	Tolerance	Minimum	Tolerance
<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>	<i>Inch</i>
1/8	-----	-----	-----	-----	0.060	+0.020	0.100	+0.020
1/4	-----	-----	-----	-----	0.060	+0.020	0.130	+0.020
3/8	-----	-----	-----	-----	0.060	+0.020	0.163	+0.020
1/2	-----	-----	-----	-----	0.062	+0.020	0.168	+0.020
3/4	0.060	+0.020	0.062	+0.020	0.078	+0.020	0.175	+0.021
1	0.063	+0.020	0.077	+0.020	0.097	+0.020	0.219	+0.028
1 1/4	0.079	+0.020	0.098	+0.020	0.123	+0.020	0.227	+0.027
1 1/2	0.090	+0.020	0.112	+0.020	0.141	+0.020	0.211	+0.025
2	0.113	+0.020	0.140	+0.020	0.176	+0.021	0.216	+0.026
2 1/2	0.137	+0.020	0.169	+0.020	0.213	+0.026	0.261	+0.031
3	0.167	+0.020	0.206	+0.025	0.259	+0.031	0.259	+0.031
3 1/2	0.190	+0.023	0.235	+0.028	0.296	+0.036	0.296	+0.036
4	0.214	+0.026	0.265	+0.032	0.333	+0.040	0.265	+0.032
5	0.265	+0.032	0.327	+0.039	0.412	+0.049	0.327	+0.039
6	0.316	+0.038	0.390	+0.047	0.491	+0.059	0.316	+0.038
8	0.410	+0.049	0.508	+0.061	-----	-----	0.332	+0.040
10	0.511	+0.061	0.632	+0.076	-----	-----	0.331	+0.040
12	0.606	+0.073	0.750	+0.090	-----	-----	0.311	+0.037

¹ The minimum is the least wall thickness of the pipe at any cross section. All tolerances are on the plus side of the minimum requirement.

TABLE 5. Sustained pressure test conditions for water at 23° C (73.4° F) for PVC plastic pipe

Dimension ratio	Pressure ¹ required for test		
	PVC1120 PVC1220	PVC4116	PVC2110
	<i>p.s.i.</i>	<i>p.s.i.</i>	<i>p.s.i.</i>
4.15	2670	2300	1460
5	2100	1840	1150
6	1680	1460	920
7.3	1330	1150	740
9	1050	920	580
11	840	740	460
13.5	670	580	370
17	530	460	290
21	420	370	230
26	340	290	180
32.5	260	230	150
41	210	180	120
64	130	120	70

¹ The fiber stresses used to derive these test pressures are as follows:

PVC1120—4200 p.s.i.

PVC1220—4200 p.s.i.

PVC4116—3680 p.s.i.

PVC2110—2300 p.s.i.

Some minor adjustments have been made to keep the test pressures uniform to simplify testing.

TABLE 6. Burst pressure requirements for water at 23° C (73.4° F) for PVC plastic pipe

Dimension ratio	Minimum burst pressures ¹	
	PVC1120 PVC1220 PVC4116	PVC2110
	<i>p.s.i.</i>	<i>p.s.i.</i>
4.15	4060	3170
5	3170	2500
6	2500	2000
7.3	2000	1600
9	1600	1250
11	1250	1000
13.5	1000	800
17	800	630
21	630	500
26	500	400
32.5	400	320
41	320	250
64	200	160

¹ The fiber stresses used to derive these test pressures are as follows:

PVC1120—6400 p.s.i.

PVC1220—6400 p.s.i.

PVC4116—6400 p.s.i.

PVC2110—5000 p.s.i.

Some minor adjustments have been made to keep the test pressures uniform to simplify testing.

HISTORY OF PROJECT

On November 14, 1962 the Society of the Plastics Industry, Inc., requested the cooperation of the Division in establishing a Commercial Standard for Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR and Class T).

The projects were initiated by the Thermoplastics Pipe Division, now the Plastics Pipe Institute ¹ of the SPI in cooperation with their

¹ During the development of this project the name was changed from the Thermoplastic Pipe Division to the Plastics Pipe Institute, A Division of the SPI.

joint American Society for Testing and Materials subcommittee on plastic pipe.

The drafts presented to the Division represented a consensus of the views of approximately 400 producers, raw materials suppliers, users and members of national, municipal, and other code bodies as well as the views of the interested ASTM organization. All comments were considered in open meetings of the SPI and ASTM, and adjustments were made wherever practicable.

Following review of the proposals by the National Bureau of Standards, the Recommended Commercial Standards were widely circulated to industry on January 14, 1963, for consideration and acceptance. Sufficient acceptances were received to assure success of the standard.

Accordingly, on May 10, 1963, the new edition, Commercial Standard CS256-63, was announced to become effective for new production on July 1, 1963.

Project Manager: C. G. Hemmer, Commodity Standards Division, Office of Technical Services, U.S. Department of Commerce.

Technical Advisor: Dr. G. M. Kline, Chief, Organic and Fibrous Materials Division, National Bureau of Standards.

STANDING COMMITTEE

In accordance with the established procedure for keeping recommendations abreast of current conditions and best industry practice, this program will be reviewed from time to time, and revised whenever necessary. For this purpose, a standing committee composed of representatives of the industry has been appointed. All comments and suggestions concerning the recommendation will be referred to the standing committee for consideration. This committee also serves as the medium through which the industry may be consulted, and through which the industry may in turn make known its views concerning the recommendations. The members of this committee are:

William Enright, Glamorgan Plastics, Div. of Glamorgan Pipe and Foundry Co.,
Drawer 740, Lynchburg, Va. (Chairman)

W. Sidney Aitken, Baldwin Extruded Products, Inc., 12,200 Woodruff Ave.,
Downey, Calif.

E. L. Bixby, Goodall Rubber Co., 572 Whitehead Road, Trenton, N.J.

W. W. Clark, Carlon Products Corp., P.O. Box 133, Aurora, Ohio.

G. F. Cohan, B. F. Goodrich Chemical Co., 3135 Euclid Ave., Cleveland, Ohio.

J. Jaglom, International Pipe and Ceramics Corp., 150 Rutledge Ave., East
Orange, N.J.

W. K. Klein, Joseph T. Ryerson & Son, Inc., P.O. Box 8000-A, Chicago, Ill.

Richard N. Poux, Skyline Industries Sales, Inc., Titusville, Pa.

Gary B. Richmond, Diamond Alkali Co., Divisional Technical Center, P.O. Box
191, Painesville, Ohio.

Ben Schlewe, Marken Plastic Corp., 2250 East 111th Street, Los Angeles, Calif.

C. W. Tomlinson, Gary Chemical Inc., P.O. Box 38, East Brunswick, N.J.

Lawrence Wells, Gould National Battery Co., Lynchburg, Va.

Richard E. White, National Assn. of Plumbing-Heating-Cooling Contractors,
1016 20th Street N.W., Washington, D.C.

Dr. Frank W. Reinhart, Director, Technical Div., Plastics Pipe Institute
9918 Sutherland Road, Silver Spring, Md.

ACCEPTORS

The manufacturers, distributors, users and others listed below have individually indicated in writing their acceptance of this Commercial Standard prior to its publication. The acceptances indicate an intention to utilize the Standard as far as practicable, but reserve the right to depart from it as may be deemed desirable. The list is published to show the extent of recorded public support for the Standard, and should not be construed as indicating that all products made by the acceptors actually comply with its requirements.

Products that meet all requirements of the standard may be identified as such by a certificate, grade mark, or label. Purchasers are encouraged to require such specific evidence of compliance, which may be given by the manufacturer whether or not he is listed as an acceptor.

ASSOCIATIONS

(General Support)

American Institute of Architects, Washington, D.C.
Central Supply Association, Chicago, Ill.
National Association of Plumbing—Heating—Cooling Contractors, Washington, D.C.
Plastic Pipe Institute, A Division of the Society of the Plastics Industry, Inc., New York, N.Y.

FIRMS AND OTHER INTERESTS

ACF Industries, Inc., ACF Technical Center, St. Charles, Mo.
Alpha Plastics, Inc., Livingston, N.J.
Amco Plastic Pipe Co., San Leandro, Calif.
American Agricultural Chemical Co., New York, N.Y.
American Brass & Iron Foundry, Plastics Div., Newark, Calif.
American Cyanamid Co., Plastics & Resins Div., Wallingford, Conn.
American Hard Rubber Co., Div. of Amerace Corp., Butler, N.J.
Anaconda American Brass Co., Waterbury, Conn.
Anderson, Ted D., Construction Co., Kokomo, Ind.
Arizona Plastic Extrusion Co., Phoenix, Ariz.
Armite Laboratories, Los Angeles, Calif.
Avisun Corp., Philadelphia, Pa.
Baldwin Extruded Products, Inc., Downey, Calif.
Barringham Plastics Ltd., Clarkson, Ontario, Canada
Belble's Pump & Supply, Emmaus, Pa.
Bellingham Supply, Inc., Bellingham, Wash.
Berg Construction Co., Inc., Juneau, Alaska
Better Lawns, Inc., Mineral Wells, Tex.
Bolta Products Division, General Tire & Rubber Co., Lawrence, Mass.
Busada Manufacturing Corp., Flushing, N.Y.
Camlet, J. Thomas, Architect & Engineer, Garfield, N.J.
Canadian General Electric Co., Ltd., Plastics Section, Cobourg, Ontario, Canada
Cannelton Sewer Pipe Co., Inc., Cannelton, Ind.
Cannon & Mullen, Architects, Salt Lake City, Utah
Carlson Products Corp., Aurora, Ohio
Cary Chemicals Inc., East Brunswick, N.J.
Colonial Plastics Manufacturing Co., Cleveland, Ohio
Commercial Solvents Corp., New York, N.Y.
Consolidated Pipe Co. of America, Stow, Ohio

Consolidated Plastics, Inc., McPherson, Kans.
Consolidated Supply Co., Portland, Oreg.
Cooperative G.L.F. Exchange, Inc., Farm Supplies Div., Ithaca, N.Y.
Cracker Asphalt Corp., Douglasville, Ga.
Crane Supply Co., Chicago, Ill.
Crescent Plastics, Inc., Evansville, Ind.
Crown-Line Plastics, Inc., Hamburg, Iowa
DeBell & Richardson, Inc., Hazardville, Conn.
Diamond Alkali Co., Cleveland, Ohio
Diversified Plastics, Inc., Memphis, Tenn.
Dixie Plastics Manufacturing Co., New Orleans, La.
Dolplex, Inc., Lake Park, Fla.
DowSmith, Inc., Milwaukee, Wis.
Electric Hose & Rubber Co., Wilmington, Del.
El Paso Natural Gas Products Co., El Paso, Tex.
Engineered Plastic Products Co., Spokane, Wash.
Esco Corp., Los Angeles, Calif.
Federal Corp., Oklahoma City, Okla.
Fullerton Manufacturing Co., Fullerton, Calif.
Gaspro, Ltd., Honolulu, Hawaii
Gering Plastics Co., A Dept. of Monsanto Chemical Co., Kenilworth, N.J.
Glamorgan Pipe & Foundry Co., Plastics Div., Lynchburg, Va.
Goldthwaite's of Texas, Inc., Fort Worth, Tex.
Goodall Rubber Co., Trenton, N.J.
Goodrich Chemical, B. F., Co., Cleveland, Ohio
Goodrich Industrial Products, B. F., Co., Rigid Plastics Div., Marietta, Ohio
Goodyear Tire & Rubber Co., Chemical Div., Akron, Ohio
Grinnell Co., Inc., Providence, R.I.
Halby Chemical Co., Inc., Wilmington, Del.
Hogner, P.E.L., Architect, Fort Lauderdale, Fla.
International Pipe and Ceramics Corp., East Orange, N.J.
International Refineries, Wrenshall, Minn.
Japan Cotton Co., Dallas, Tex.
Johnson Plastic Corp., Chagrin Falls, Ohio
Kerr-McGee Oil Industries, Inc., Oklahoma City, Okla.
King John and Associates, Cupertino, Calif.
Kraloy/Chemtrol Co., Santa Ana, Calif.
Landmark Engineering Co., Tucson, Ariz.
Lasco Industries, Montebello, Calif.

Loeb, Laurence M., Architect, White Plains, N.Y.

Mannesmann-Easton Plastic Products Co., Inc., Easton, Pa.

Marken Plastic Corporation, Los Angeles, Calif.

McDonald, A. Y., Manufacturing Co., Dubuque, Iowa

McPherson Co., Architects-Engineers, Greenville, S.C. (General Support)

Meyer, F. & J., New York, N.Y.

Miller, Miller & Associates, Architects, Terre Haute, Ind.

Mitron Research & Development Corp., Waltham, Mass.

Monsanto Chemical Corp., Springfield, Mass.

New Mexico State University, Physical Plant Dept., University Park, N. Mex.

Northwest Natural Gas Co., Portland, Oreg. (General Support)

Northwestern Public Service Co., Huron, South Dakota

Orangeburg Manufacturing Co., Div. of The Flintkote Co., New York, N.Y.

Palmer Supply Co., Seattle, Wash.

Palomar Refining and Oil Co., Bakersfield, Calif.

Parish, Archie G., Architect, St. Petersburg, Fla.

Patzig Testing Laboratories, Inc., Des Moines, Iowa

Perma-Pipe Corp., Middlesboro, Ky.

Perma Vinyl Corp., Miami, Fla.

Pfanstiehl Laboratories, Waukegan, Ill.

Plastex Co., Columbus, Ohio

Plastiline, Inc., Pompano Beach, Fla.

Portland General Electric Co., Portland, Oreg.

R & K Plastic Industries Co., IPF Div., Cleveland, Ohio

Raub Supply Co., Lancaster, Pa.

Republic Steel Corp., Cleveland, Ohio

Riverside Chemical Co., Inc., North Tonawanda, N.Y.

Rock Island Refining Corp., Indianapolis, Ind.

Ryerson, Joseph T. & Son, Inc., Chicago, Ill., and Service Centers at Boston, Mass.; Buffalo, N.Y.; Charlotte, N.C.; Cincinnati, Cleveland, Ohio; Dallas, Tex.; Detroit, Mich.; Emeryville, Calif.; Houston, Tex.; Indianapolis, Ind.; Jersey City, N.J.; Los Angeles, Calif.; Milwaukee, Wis.; Philadelphia, Pittsburgh, Pa.; St. Louis, Mo.; Seattle, Spokane, Wash.; Wallingford, Conn.

Ryko Products, Inc., Los Angeles, Calif.

San Antonio, City of, Parks & Recreation Dept., San Antonio, Tex.

Schulman, A., Inc., Akron, Ohio

Scovill Manufacturing Co., Waterbury, Conn.

Sears, Roebuck & Co., Chicago, Ill.

Sedco Manufacturing Co., Inc., Miami, Fla.

Skelly Oil Co., Tulsa, Okla.

Skyline Industries Sales, Inc., Titusville, Pa.

Skyline Plastic Pipe, Inc., Titusville, Pa.

Sloane Manufacturing Co., Div. Atlantic Research Corp., Sun Valley, Calif.

Soule Construction Co., Inc., Pensacola, Fla.

Southeast Distributing Co., Miami, Fla.

Southwestern Plastic Pipe Co., Phoenix, Ariz.

Southwestern Plastic Pipe Co., Mineral Wells, Tex.

Stauffer Chemical Co., Molded Products Div., Los Angeles, Calif.

Tampa Wholesale Plumbing Supply Corp., Tampa, Fla.

Telsco Industries, Dallas, Tex.

Texacon Industries, Inc., Kearny, N.J.

ThermoPlastics Corporation, Charlotte, N.C.

Triangle Conduit & Cable Co., Inc., New Brunswick, N.J.

Trubek Chemical Co., East Rutherford, N.J.

Tube Turns Plastics, Inc., Louisville, Ky.

Union Carbide Plastics Co., Bound Brook, N.J.

Union Malleable Manufacturing Co., Plastics Div., Ashland, Ohio

University of Texas, School of Architecture, Austin, Texas

Uyesaka Bros., Inc., Clovis, Calif.

Vogel, Willis A., Architect & Consultant, Toledo, Ohio

Wade, R. M., & Co., Portland, Oreg.

Welch, Carroll E., Architect, Huntington, N.Y.

Western Plastics Corp., Hastings, Nebr.

Western Plastics Corp., Tacoma, Wash.

Woodward, Wight & Co., LTD., New Orleans, La.

Worthington Associates, Inc., Corvallis, Oreg.

Yardley Plastics Co., Columbus, Ohio

U.S. GOVERNMENT

General Services Administration, Standardization Div., Washington, D.C.

Health, Education, and Welfare, Department of, Washington, D.C.

Interior, Department of, Washington, D.C.

Post Office Department, Procurement Div., Washington, D.C.

Veterans Administration, Washington, D.C.

ACCEPTANCE OF COMMERCIAL STANDARD

CS256-63 Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR and Class T).

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this Commercial Standard.

Date _____

Office of Commodity Standards
National Bureau of Standards
U.S. Department of Commerce
Washington, D.C. 20234

Gentlemen:

We believe that this Commercial Standard constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable in the

production¹ distribution¹ purchase¹ testing¹
of this commodity.

We reserve the right to depart from the standard as we deem advisable.

We understand, of course, that only those articles which actually comply with the standard in all respects can be identified or labeled as conforming thereto.

Signature of authorized officer _____
(In ink)

(Kindly typewrite or print the following lines)

Name and title of above officer _____

Organization _____

Street address _____
(Fill in exactly as it should be listed)

City, zone, and State _____

¹ Underscore the applicable words. Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interest, trade associations, trade papers, etc., desiring to record their general support, the words "General support" should be added after the signature.

(Cut on this line)

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial Standards are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions, but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices, and the like.

2. *The acceptor's responsibility.*—The purpose of Commercial Standards is to establish, for specific commodities, nationally recognized grades or consumer criteria, and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the standard, where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function, performed by the Department of Commerce in the voluntary establishment of Commercial Standards on a nationwide basis is fourfold: First, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active, valid opposition, the success of the project is announced. If, however, in the opinion of the standing committee or of the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.