Designation: ~~C700 – 11~~ C700 – 13

Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated[1]

This standard is issued under the fixed designation C700; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification establishes the criteria for acceptance, prior to installation, of extra strength and standard strength vitrified clay pipe and fittings to be used for the conveyance of sewage, industrial wastes, and storm water; and extra strength perforated and standard strength perforated vitrified clay pipe to be used for underdrainage, filter fields, leaching fields, and similar subdrainage installations.

1.2 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.

NOTE 1—Attention is called to Specification C425, Test Method C828, Test Method C1091, Test Methods C301, and Terminology C896.

1.3 The following precautionary caveat pertains only to the Test Method portion, 5.2-5.2.3.2 of this standard: *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C301 Test Methods for Vitrified Clay Pipe
C425 Specification for Compression Joints for Vitrified Clay Pipe and Fittings
C828 Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines
C896 Terminology Relating to Clay Products
C1091 Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines

3. Terminology

3.1 *Definitions*—Clay, fire clay, shale, and surface clay are as defined in Terminology C896.

4. Materials and Manufacture

4.1 Vitrified clay pipe shall be manufactured from fire clay, shale, surface clay, or a combination of these materials that, when formed into pipe and fired to suitable temperatures, yields a product that conforms to this specification.

5. Physical Properties

5.1 *Bearing Strength:*

5.1.1 Pipe shall meet the bearing strength requirements of Table 1.

5.1.2 The number of specimens to be tested shall not exceed 0.5 % of the number of pipe of each size furnished, except that no less than two specimens shall be tested.

5.1.3 If any of the test specimens fail to meet the requirements, the manufacturer will be allowed a retest on two additional specimens for each one that failed. The pipe will be acceptable if all the retest specimens meet the test requirement.

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[1] This specification is under the jurisdiction of ASTM Committee C04 on Vitrified Clay Pipe and is the direct responsibility of Subcommittee C04.20 on Methods of Test and Specifications

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[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.

TABLE 1 Minimum Strength (3-Edge Bearing)

~~COLSPEC/colname="col9" align="center"~~

Nominal Size, in. (mm)	lbf/linear ft	kN/linear m	lbf/linear ft	kN/linear m	lbf/linear ft	kN/linear m	lbf/linear ft	kN/linear m	Extra Strengt Vitrified Clay P
~~3 (76)~~	~~2000~~	~~29~~	...	...	...	...	...	...	
3 (76)	2000	29	...	...	...	...	...	...	
~~4 (100)~~	~~2000~~	~~29~~	~~1200~~	~~18~~	~~1250~~	~~18~~	~~1000~~	~~15~~	
4 (100)	2000	29	1200	18	1250	18	1000	15	
5 (125)	2000	29	1200	18	1250	18	1000	15	
~~6 (150)~~	~~2000~~	~~29~~	~~1200~~	~~18~~	~~1600~~	~~23~~	~~1000~~	~~15~~	
6 (150)	2000	29	1200	18	1600	23	1000	15	
~~8 (205)~~	~~2200~~	~~32~~	~~1400~~	~~20~~	~~1600~~	~~23~~	~~1000~~	~~15~~	
8 (205)	2200	32	1400	20	1600	23	1000	15	
~~10 (255)~~	~~2400~~	~~35~~	~~1600~~	~~23~~	~~1600~~	~~23~~	~~1100~~	~~16~~	
10 (255)	2400	35	1600	23	1600	23	1100	16	
~~12 (305)~~	~~2600~~	~~38~~	~~1800~~	~~26~~	~~1800~~	~~26~~	~~1200~~	~~18~~	
12 (305)	2600	38	1800	26	1800	26	1200	18	
~~15 (380)~~	~~2900~~	~~42~~	~~2000~~	~~29~~	~~2200~~	~~32~~	~~1400~~	~~20~~	
15 (380)	2900	42	2000	29	2200	32	1400	20	
~~18 (455)~~	~~3300~~	~~48~~	~~2200~~	~~32~~	~~2640~~	~~39~~	~~1700~~	~~25~~	
18 (455)	3300	48	2200	32	2640	39	1700	25	
~~21 (535)~~	~~3850~~	~~56~~	~~2400~~	~~35~~	~~3100~~	~~45~~	~~2000~~	~~29~~	
21 (535)	3850	56	2400	35	3100	45	2000	29	
~~24 (610)~~	~~4400~~	~~64~~	~~2600~~	~~38~~	~~3520~~	~~51~~	~~2400~~	~~35~~	
24 (610)	4400	64	2600	38	3520	51	2400	35	
27 (685)	4700	69	...	...	...	...	...	...	
30 (760)	5000	73	...	...	...	...	...	...	
~~33 (840)~~	~~5500~~	~~80~~	...	...	...	...	...	...	
33 (840)	5500	80	...	...	...	...	...	...	
36 (915)	6000	88	...	...	...	...	...	...	
~~39 (990)~~	~~6600~~	~~96~~	...	...	...	...	...	...	
39 (990)	6600	96	...	...	...	...	...	...	
~~42 (1065)~~	~~7000~~	~~102~~	...	...	...	...	...	...	
42 (1065)	7000	102	...	...	...	...	...	...	
								48 (1220)	8000 11

5.1.4 If, subsequent to an initial pipe strength failure, the accuracy of the testing equipment is questioned, at the request of the manufacturer, the equipment shall be recalibrated and a retest made or a retest made upon equipment of known accuracy.

5.2 *Hydrostatic Pressure Test or Absorption Test:*

5.2.1 The manufacturer shall at his option, apply either a hydrostatic pressure test or an absorption test to all of the test specimens in each size and run of the pipe.

5.2.2 *Hydrostatic Pressure Test:*

5.2.2.1 When the pipe is subjected to an internal hydrostatic pressure of 10 psi (68.9 KPa) for the elapsed time shown in the following table, there shall be no leaking on the exterior of the pipe. Moisture appearing on the surface of the pipe in the form of beads adhering to the surface shall not be considered leakage. However, moisture which starts to run on the pipe shall be construed as leakage regardless of quantity.

~~Hydrostatic Pressure Test Time~~

~~Thickness of Barrel in. (mm)~~	~~Test Time (min.)~~
~~Up to and including 1 (25)~~	~~7~~
~~Over 1 (25) including 1½ (38)~~	~~9~~
~~Over 1½ (38) including 2 (51)~~	~~12~~
~~Over 2 (51) including 2½ (64)~~	~~15~~
~~Over 2½ (64) including 3 (76)~~	~~18~~
~~Over 3 (76)~~	~~21~~

Hydrostatic Pressure Test Time

Thickness of Barrel in. (mm)	Test Time (min.)
Up to and including 1 (25)	7
Over 1 (25) including 1½ (38)	9
Over 1½ (38) including 2 (51)	12
Over 2 (51) including 2½ (64)	15
Over 2½ (64) including 3 (76)	18
Over 3 (76)	21

5.2.2.2 If any of the test specimens fail to meet the Hydrostatic Pressure Test requirements, a retest will be allowed and the pipe accepted as provided in 5.1.3.

5.2.3 *Absorption Test:*

5.2.3.1 The absorption of vitrified clay pipe shall not exceed 8%.

5.2.3.2 If any of the test specimens fail to meet the absorption requirements, a retest will be allowed and the pipe accepted as provided in 5.1.3.

5.3 *Acid Resistance:*

5.3.1 This test is used to determine the resistance of pipe to the action of acids encountered in sanitary sewers. The test shall be performed only when specified.

5.3.2 The pipe of each size and shipment shall be acceptable if the acid-soluble matter, from specimens representing such pipe, does not exceed 0.25 %.

5.3.3 If any of the tests specimens fail to meet the acid resistance requirements, a retest, representative of the original material lot, in that particular acid will be allowed and the pipe accepted as provided in 5.1.3.

6. Allowable Limits for Dimensional Variation

6.1 Sizes and dimensions of pipe are as described in Table 2.

6.2 The inside diameter shall not vary from a true circle by more than 3 % of its nominal diameter measured at any one location along the pipe barrel.

6.3 The average inside diameter shall be determined by taking any two 90° (1.6-rad) opposing measurements and averaging the readings.

7. Straightness

7.1 Pipe shall not deviate from straight by more than 1⁄16 in./ft (5 mm/m) of length when the maximum offset is measured from the concave side of the pipe.

7.2 Measurement shall be taken by placing a straightedge on the concave side of the full length of the pipe barrel, excluding the spigot joint material or socket, and measuring the maximum distance between the straightedge and concave side of the pipe.

TABLE 2 Available Limits for Dimensional Variation

~~COLSPEC/colname="col4" align="center"~~

Nominal Size, in. (mm)[A]	Laying Length Limit of Minus Variation, in./ft (mm/m)	Difference in Length of Two Opposite Sides Max, in. (mm)	Limit of Minus Variations from Nominal Size in Average Inside Diameter, in. (mm)
~~3 (76)~~	~~¼ (21)~~	~~5⁄16 (8)~~	~~3⁄16 (5)~~
3 (76)	¼ (21)	5⁄16 (8)	3⁄16 (5)
~~4 (100)~~	~~¼ (21)~~	~~5⁄16 (8)~~	~~3⁄16 (5)~~
4 (100)	¼ (21)	5⁄16 (8)	3⁄16 (5)
5 (125)	¼ (21)	3⁄8 (10)	¼ (6)
~~6 (150)~~	~~¼ (21)~~	~~3⁄8 (10)~~	~~¼ (6)~~
6 (150)	¼ (21)	3⁄8 (10)	¼ (6)
~~8 (205)~~	~~¼ (21)~~	~~7⁄16 (11)~~	~~5⁄16 (8)~~
8 (205)	¼ (21)	7⁄16 (11)	5⁄16 (8)
~~10 (255)~~	~~¼ (21)~~	~~7⁄16 (11)~~	~~3⁄8 (10)~~
10 (255)	¼ (21)	7⁄16 (11)	3⁄8 (10)
~~12 (305)~~	~~¼ (21)~~	~~7⁄16 (11)~~	~~7⁄16 (11)~~
12 (305)	¼ (21)	7⁄16 (11)	7⁄16 (11)
~~15 (380)~~	~~¼ (21)~~	~~½ (13)~~	~~9⁄16 (14)~~
15 (380)	¼ (21)	½ (13)	9⁄16 (14)
~~18 (455)~~	~~¼ (21)~~	~~½ (13)~~	~~11⁄16 (17)~~
18 (455)	¼ (21)	½ (13)	11⁄16 (17)
~~21 (535)~~	~~3⁄8 (31)~~	~~9⁄16 (14)~~	~~13⁄16 (21)~~
21 (535)	3⁄8 (31)	9⁄16 (14)	13⁄16 (21)
~~24 (610)~~	~~3⁄8 (31)~~	~~9⁄16 (14)~~	~~15⁄16 (24)~~
24 (610)	3⁄8 (31)	9⁄16 (14)	15⁄16 (24)
~~27 (685)~~	~~3⁄8 (31)~~	~~5⁄8 (16)~~	~~1 1⁄16 (27)~~
27 (685)	3⁄8 (31)	5⁄8 (16)	1 1⁄16 (27)
~~30 (760)~~	~~3⁄8 (31)~~	~~5⁄8 (16)~~	~~1 3⁄16 (30)~~
30 (760)	3⁄8 (31)	5⁄8 (16)	1 3⁄16 (30)
~~33 (840)~~	~~3⁄8 (31)~~	~~5⁄8 (16)~~	~~1 5⁄16 (33)~~
33 (840)	3⁄8 (31)	5⁄8 (16)	1 5⁄16 (33)
~~36 (915)~~	~~3⁄8 (31)~~	~~11⁄16 (17)~~	~~1 7⁄16 (37)~~
36 (915)	3⁄8 (31)	11⁄16 (17)	1 7⁄16 (37)
~~39 (990)~~	~~3⁄8 (31)~~	~~¾ (19)~~	~~1 7⁄16 (37)~~
39 (990)	3⁄8 (31)	¾ (19)	1 7⁄16 (37)
~~42 (1065)~~	~~3⁄8 (31)~~	~~7⁄8 (22)~~	~~1 7⁄16 (37)~~
42 (1065)	3⁄8 (31)	7⁄8 (22)	1 7⁄16 (37)
			48 (1220) 3⁄8 (31) 7⁄8 (22) 1

[A] Specifiers should be aware that all pipe sizes are not universally available.