This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: C4 – 04 (Reapproved 2023)

Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile[1]

This standard is issued under the fixed designation C4; 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 U.S. Department of Defense.

1. Scope

1.1 This specification establishes the criteria for acceptance, prior to installation, of drain tile and perforated drain tile 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.

1.3 The following safety hazards caveat pertains only to the Test Methods portion of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—Attention is called to Test Methods C301 and Terminology C896.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C301 Test Methods for Vitrified Clay Pipe

C896 Terminology Relating to Clay Products

3. Terminology

3.1 *Definitions:*

3.1.1 *Clay, fire clay, shale,* and *surface clay* are as defined in Terminology C896.

3.1.2 Within this specification, the terms *tile, drain tile*, and *clay drain tile* are synonyms.

4. Classification

4.1 Four classes of clay drain tile are specified:

4.1.1 Standard.

4.1.2 Extra Quality.

4.1.3 Heavy Duty.

4.1.4 Extra Strength.

4.2 Drain tile of a higher strength classification than that specified by the purchaser may be furnished by the seller, provided the substituted drain tile meets the physical requirements of the class specified.

5. Materials and Manufacture

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

6. Physical Properties

6.1 Drain tile shall meet the physical test requirements for the class, as specified in Table 1.

6.2 The maximum water absorption (5-h boiling) shall be as follows:

	Average, %	Individual, %
Standard	13	16
Extra Quality	11	13
Heavy Duty	11	13
Extra Strength	11	13

6.3 The requirements for water absorption (5–h boiling) shall be waived, provided that test specimens meet the requirements of the freezing and thawing test, Section 13, of this specification

7. Sizes and Perforations

7.1 The size of drain tile shall be designated by inside diameter. Not all sizes and strengths may be available from all manufacturers.

7.2 The minimum length of drain tile smaller than 10 in. (255 mm) diameter shall be approximately 12 in. (305 mm).

[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.

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TABLE 1 Physical Test Requirements for Clay Drain Tile

Internal Diameter of Tile, in.	Standard		Extra Quality		Heavy Duty		Extra Strength	
	Minimum Crushing Strength,[A] lbf/linear ft (kN/m)		Minimum Crushing Strength,[A] lbf/linear ft (kN/m)		Minimum Crushing Strength,[A] lbf/linear ft (kN/m)		Minimum Crushing Strength,[A] lbf/linear ft (kN/m)	
	Average	Individual	Average	Individual	Average	Individual	Average	Individual
3½	800 (12)	680 (10)	1100 (16)	990 (14)	1400 (20)	1260 (18)	2000 (29)	1800 (26)
4	800 (12)	680 (10)	1100 (16)	990 (14)	1400 (20)	1260 (18)	2000 (29)	1800 (26)
5	800 (12)	680 (10)	1100 (16)	990 (14)	1400 (20)	1260 (18)	2000 (29)	1800 (26)
6	800 (12)	680 (10)	1100 (16)	990 (14)	1400 (20)	1260 (18)	2000 (29)	1800 (26)
8	800 (12)	680 (10)	1100 (16)	990 (14)	1500 (22)	1350 (20)	2140 (31)	1920 (28)
10	800 (12)	680 (10)	1100 (16)	990 (14)	1550 (23)	1400 (20)	2200 (32)	1980 (29)
12	800 (12)	680 (10)	1100 (16)	990 (14)	1700 (25)	1530 (22)	2420 (35)	2170 (32)
14	840 (12)	720 (11)	1100 (16)	990 (14)	1850 (27)	1660 (24)	2640 (39)	2370 (35)
15	870 (13)	740 (11)	1150 (17)	1030 (15)	1980 (29)	1780 (26)	2800 (41)	2620 (38)
16	. . .	. . .	1200 (18)	1080 (16)	2100 (31)	1890 (28)	3000 (44)	2700 (39)
18	. . .	. . .	1300 (19)	1170 (17)	2340 (34)	2100 (31)	3300 (48)	2970 (43)
21	. . .	. . .	1450 (21)	1300 (19)	2680 (39)	2410 (35)	. . .	. . .
24	. . .	. . .	1600 (23)	1440 (21)	3000 (44)	2700 (39)	. . .	. . .
27	. . .	. . .	1800 (26)	1620 (24)	3330 (49)	3000 (44)	. . .	. . .
30	. . .	. . .	2000 (29)	1800 (26)	3590 (52)	3230 (47)	. . .	. . .

[A] Strengths of sizes not listed may be interpolated between tabular values of sizes and strengths of the nearest listed diameters.

7.3 The length of drain tile 10 in. (255 mm) through 30 in. (760 mm) diameter shall be not less than 1½ times their diameter.

7.4 *Perforations*—Perforations shall be circular and cleanly cut through the tile wall. They shall be arranged in rows parallel to the longitudinal axis of the tile. The minimum number of rows of perforations shall be as shown in Table 2.

7.4.1 Where two rows of perforations are used, the rows shall be separated by an arc of 90 ± 15°.

7.4.2 Where four rows of perforations are used, the rows shall be symmetrical around a vertical centerline. The lowermost rows of perforations shall be separated by an arc of 90 ± 10°, and the uppermost rows shall be separated by an arc of not over 160° measured around the lower part of the tile (Fig. 1).

7.4.3 If more than four rows of perforations are used, the spacing of rows shall be uniform between the limits in 7.4.2.

7.4.4 The purchaser shall specify the desired perforation diameter option of: (*1*) ¼ ± 1⁄16 in. (6.4 ± 1.6 mm) or (*2*) ½ ± ⅛ in. (13 ± 3.2 mm), and the number of rows of perforations.

7.4.5 Perforations shall not be spaced more than approximately 3 in. (76 mm) center-to-center along the rows.

8. Workmanship and Finish

8.1 Drain tile shall be free of cracks, checks, or chips that decrease the strength.

8.2 Drain tile shall conform to the permissible dimensional variations in Table 3.

8.3 Plain-end tile shall be furnished unless otherwise specified by the purchaser.

8.3.1 The ends of plain-end tile shall be sufficiently square as to make close joints.

9. Sampling and Testing

9.1 Tile shall be sampled and tested in accordance with Sections 11 through 13.

9.2 For test purposes, full-size drain tile shall be selected by the purchaser or his authorized representative. Tile shall be representative of the lot from which they are selected. The place or places of selection shall be designated when the purchase order is issued. The manufacturer or seller shall furnish test tile without charge.

9.3 Each tile shall be individually marked so that it is identifiable within the testing period.

10. Basis of Acceptance

10.1 Acceptability of nonperforated drain tile is determined by compliance with the requirements of Table 1, Table 3, and the inspection requirements of Section 14.

10.2 Acceptability of perforated drain tile is determined by compliance with the requirements of Tables 1-3 and the inspection requirements of Section 14.

TEST METHODS

11. Crushing Strength Test

11.1 *Test Samples:*

11.1.1 Test tile shall be sound, full size, and selected by the purchaser or his representative.

11.1.2 The number of tile to be tested shall not exceed 0.5 % of the number of tile of each size furnished, except that no less than five tile of each size shall be tested.

11.2 *Loading Apparatus (see Fig. 2):*

11.2.1 *Testing Machine:*

11.2.1.1 The loading apparatus may consist of any mechanically driven or hand-powered device that is capable of applying the necessary loads, with upper and lower bearings capable of transmitting these loads to the tile. The bearings shall be bearing beams and contact edges.

11.2.1.2 Any device that is capable of applying a load at a uniform rate, from 500 to 2000 lbf/linear ft·min (7.3 to 29 KN/linear m·min) of tile length, may be used for making the test.