Designation: F1700 – 13a

Standard Specification for Solid Vinyl Floor Tile[1]

This standard is issued under the fixed designation F1700; 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 covers solid vinyl[2] floor tiles that are monolithic, surface decorated or printed, and protected by a clear wear layer.

1.2 This type of floor covering is intended for use in commercial, light commercial, and residential buildings. General information and performance characteristics which determine serviceability and recommended use are included in this specification.

1.3 *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.*

1.4 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.

2. Referenced Documents

2.1 *ASTM Standards:*[3]

F137 Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus

F141 Terminology Relating to Resilient Floor Coverings

F373 Test Method for Embossed Depth of Resilient Floor Coverings

F386 Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces

F410 Test Method for Wear Layer Thickness of Resilient Floor Coverings by Optical Measurement

F925 Test Method for Resistance to Chemicals of Resilient Flooring

F1514 Test Method for Measuring Heat Stability of Resilient Flooring by Color Change

F1515 Test Method for Measuring Light Stability of Resilient Flooring by Color Change

F1914 Test Methods for Short-Term Indentation and Residual Indentation of Resilient Floor Covering

F2055 Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method

F2199 Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat

2.2 *Other Standards:*

ANSI/ASQC Z1.4–1993 Sampling Procedures and Tables for Inspection by Attributes[4]

3. Classification

3.1 The vinyl floor tiles covered by this specification shall be classified as follows:

3.1.1 *Class I*—Monolithic Vinyl Tile.

3.1.1.1 *Type A*—Smooth Surface.

3.1.1.2 *Type B*—Embossed Surface.

3.1.2 *Class II*—Surface-Decorated Vinyl Tile.

3.1.2.1 *Type A*—Smooth Surface.

3.1.2.2 *Type B*—Embossed Surface.

3.1.3 *Class III*—Printed Film Vinyl Tile.

3.1.3.1 *Type A*—Smooth Surface.

3.1.3.2 *Type B*—Embossed Surface.

3.2 The embossed surfaces may or may not be grouted with ink.

4. Ordering Information

4.1 The purchaser shall state whether this specification is to be used, select the preferred options permitted herein, and include the following contract requirements on the purchase order:

4.1.1 Title, number, and date of this specification,

4.1.2 Class, type, and pattern number (Section 3),

4.1.3 Quantity in square feet, pieces, or cartons,

4.1.4 Size required (Section 6),

4.1.5 Thickness required (Section 6),

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[2] For solid vinyl definition, refer to Terminology F141.

[3] 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.

[4] Available from American National Standards Institute, 11 West 42nd St., New York, NY 10036.

4.1.6 Lot formation if other than as specified in ANSI/ASQC Z1.4–1993 (see Sections 8 and 10),

4.1.7 Sampling if other than as specified in ANSI/ASQC Z1.4–1993 (see Sections 8 and 10),

4.1.8 Packing requirement if other than as specified (Section 12),

4.1.9 Palletization if required (agreement between the manufacturer and the purchaser),

4.1.10 Marking required if other than specified (Section 13) (agreement between the manufacturer and the purchaser),

4.1.11 Chemical resistance (see 6.8). The basic chemicals used in the test are those likely to be found in domestic, commercial and institutional use. Many proprietary compounds contain one or more of these basic chemicals. Should the flooring for unusual application need to be resistant to a specific chemical, this additional requirement should become part of the procurement document.

4.1.12 Other requirements (agreement between the manufacturer and the purchaser).

5. Material and Manufacture

5.1 *Material*—The tile shall be composed of binder, filler, and pigments compounded with suitable lubricants and processing aids. The binder consists of one or more polymers or copolymers of vinyl chloride, other modifying resins, plasticizers, and stabilizers which comprise at least the following minimum percent weight: see Table 1. The polymers or copolymers of vinyl chloride comprise at least 60 % of the weight of the binder. Any copolymer of vinyl chloride used shall contain at least 85 % vinyl chloride.

5.2 *Class, Type, and Pattern Number*—The class, type, and pattern number, as applicable shall be as specified in the contract or order (see 4.1).

NOTE 1—The patterns that are available are indicated in individual manufacturer's current catalogs.

5.3 *Monolithic Vinyl Tile*—The tile shall be uniform, with respect to color, pattern effect, and composition, throughout the thickness of the tile.

5.4 *Surface Decorated*—In surface-decorated tiles, the pattern and color need not extend through the entire thickness of the tile. The composition of each layer shall be according to Table 1.

5.4.1 The appearance of the surface decorated tile, when the wearing layer is removed by any suitable means, to a depth of 0.010 in. (0.25 mm) shall compare favorably for decoration with the tile's original appearance.

5.5 *Printed Film Vinyl Tile*—The structure of printed solid vinyl tiles is formed of vinyl wear layer which may be transparent or translucent. The pattern and colors are created by a print between the wear layer and the intermediate colored layer or base layer. Other base layers may be added. Products will comply with Table 1 for binder content.

TABLE 1 Minimum Binder Content

	Class I	Class II	Class III
Each ply or layer	34 %	34 %	. . .
Clear wear layer	. . .	. . .	90 %
Base/Inter layer(s)	. . .	. . .	30 %[A]

[A]Single composite average of binder content for layers, other than clear wear layer.

5.5.1 For commercial applications, the wear layer shall be a minimum of 0.020 in. (0.50 mm) thick.

6. Physical Requirements

6.1 *Binder Content*—The binder content shall be determined by statement of formula (Manufacturer Certificate of Compliance).

6.2 *Size*[5]—Unless otherwise specified (see 4.1.4), the tile shall be 12 by 12 in. (305 by 305 mm). A tolerance of ±0.016 in. (0.4 mm) per linear ft (305 mm) shall be permitted when measured in accordance with Test Method F2055. Certain specialty items are available in other sizes.

6.3 *Thickness:*

6.3.1 *Product*—Unless otherwise specified (see 4.1.5), the tile shall be furnished in 0.0625-in. (1.6-mm), 0.080-in. (2-mm), 0.100-in. (2.5-mm), and 0.125-in. (3-mm) thicknesses. A tolerance of ±0.005 in. (0.13 mm) shall be permitted when tested in accordance with Test Method F386.

6.3.2 *Wear Layer*—For Class III products, the thickness shall be measured in five (5) unembossed locations to determine thickness average. See Test Method F410.

6.4 *Squareness*[5]—When tested in accordance with Test Method F2055, the out-of-squareness of the tile shall not exceed 0.010 in. (0.25 mm).

6.5 *Residual Indentation*—When tested in accordance with Test Method F1914 under 140–lb (63.5–kg) load, 0.178–in. (4.5–mm) diameter flat foot and 10 min indentation, the average residual indentation at the end of 60–min recovery shall not exceed 8 %, and the maximum residual indentation of any single specimen shall not exceed 10 %.

6.6 *Flexibility*—When tested in accordance with Test Method F137 and a mandrel size of 1–in. (25.4 mm), the tile shall show no cracks or breaks.

6.7 *Dimensional Stability*—When tested in accordance with Test Method F2199, the tile shall not change in linear dimensions more than 0.020 in. (0.5 mm) per linear ft.

6.8 *Resistance to Chemicals*—The chemical resistance of solid vinyl tile shall be determined in accordance with Test Method F925. The tile shall have no more than a slight change in surface dulling, surface attack, or staining when exposed to the following chemicals:

6.8.1 White vinegar (5 % acetic acid),

6.8.2 Rubbing alcohol (70 % isopropyl alcohol),

6.8.3 White mineral oil (medicinal grade),

6.8.4 Sodium hydroxide solution (5 % NaOH),

6.8.5 Hydrochloric acid solution (5 % Hcl),

6.8.6 Sulfuric acid solution (5 % H_2SO_4),

6.8.7 Household ammonia solution (5 % NH_4OH),

6.8.8 Household bleach (5.25 % NaOCl),

6.8.9 Olive oil (light),

[5] For size, squareness, and tolerances, work is proceeding for tiles over 12 by 12 in. (305 by 305 mm).

6.8.10 Kerozene (K1),
6.8.11 Unleaded gasoline (regular grade), and
6.8.12 Phenol (5 % active phenol).

NOTE 2—The basic chemicals are representative of those likely to be found in residential, commercial, and institutional use. Many proprietary compounds contain one or more of these basic chemicals. Should the flooring for an unusual application need to be resistant to a specific chemical, this additional requirement should become part of the procurement document.

6.9 *Resistance to Heat*—When tested in accordance to Test Method F1514, the color change of the solid vinyl tile shall have an average ΔE not greater than 8.0 after 7 days exposure to 158°F (70°C).

6.10 *Resistance to Light*—When tested in accordance to Test Method F1515, the color change of the solid vinyl tile shall have an average ΔE not greater than 8.0 after a 300–h exposure.

7. Workmanship, Finish, and Appearance

7.1 The floor tile furnished in accordance with this specification shall be an acceptable match to approved samples in pattern, color, and surface appearance. The product shall be free of defects which adversely affect performance or appearance. Such defects include blemishes, breaks in corners or edges, and delamination of the plies.

8. Sampling for Test

8.1 Sampling for testing physical properties, mechanical properties, and performance requirements listed in Table 2 shall be done in accordance with the provisions set forth in ANSI/ASQC Z1.4–1993. The inspection level shall be special inspection level S-1, as noted in Table I, and the acceptable quality level (AQL) shall be 6.5 defects per hundred units as noted in Table II-A or as otherwise specified in 8.2 herein. The lot size shall be expressed in units. A unit represents a single, manufactured, inventoried, finished tile.

8.2 Sampling for testing physical properties, mechanical properties, and performance requirements listed in Table 2 shall be agreed upon by the purchaser and the manufacturer as part of the procurement document.

9. Conditioning

9.1 *Conditioning in Air*—Condition the specimens for physical tests in air maintained at 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity for not less than 3 h before testing.

9.2 *Conditioning in Water*—Maintain the water temperature at 77 ± 0.9°F (25 ± 0.5°C) unless otherwise specified. Immerse the specimen for not less than 15 min or more than 30 min before testing in either air or water.

10. Inspection

10.1 Inspection of the solid floor tile for defects that would adversely affect performance shall be done in accordance with the provisions set forth in ANSI/ASQC Z1.4–1993. The inspection level shall be level L-1, as noted in Table I, and the acceptable quality level (AQL) shall be 6.5 defects per hundred units as noted in Table II-A or as otherwise specified in 10.2 herein. The lot size shall be expressed in units. A unit represents a single, manufactured, inventoried, finished tile.

10.2 Inspection of the solid floor tile for defects that would adversely affect performance shall be agreed upon by the purchaser and the manufacturer as part of the procurement document.

11. Certification

11.1 When specified in the purchase order or contract, a manufacturer's certification and any other documents required to substantiate certification shall be furnished to the purchaser, that the material meets this specification.

12. Packaging, Packing, and Marking

12.1 Unless otherwise specified in the purchase order or contract, shipping containers shall be marked with the name of the material as defined by the contract or order under which the shipment is made, the size, thickness, the pattern number, the quantity contained therein, and the name of the manufacturer.

12.2 The vinyl floor tile shall be packaged in accordance with normal commercial practice and packed to ensure acceptance by common carrier and to provide protection against damage during normal shipping, handling, and storage or shall be as specified in 4.1.8.

TABLE 2 Characteristics and Tests

Characteristic	Requirement	Test Method	Reference
Composition of material	see Table 1	Certificate of compliance	6.1
Size, tolerance[A]	±0.016 in./lin. ft (0.4 mm/305 mm)	F2055	6.2
Thickness, product	as specified ±0.005 in. (0.13 mm)	F386	6.3
Thickness, wear layer	commercial, 0.020 in. (0.5 mm) min	F410	6.3.1
Squareness[A]	maximum 0.010 in. (0.25 mm)	F2055	6.4
Residual indentation	average less than 8 %, maximum single reading 10 %	F1914	6.5
Flexibility	1-in. (25.4-mm) mandrel, no crack or break	F137	6.6
Dimensional stability	0.020 in./lin. ft (0.51 mm/305 mm) maximum	F2199	6.7
Resistance to chemicals	No more than a slight change in surface dulling, surface attack, or staining	F925	6.8
Resistance to light	ΔE < 8 ave., max	F1515	6.10
Resistance to heat	ΔE < 8 ave., max	F1514	6.9
Embossing area	Max ⅓ of flat surface area[B]	Certificate of compliance	13

[A] For size, squareness, and tolerances, work is proceeding for tiles over 12 by 12 in. (305 by 305 mm).
[B] See Section 13 for exceptions.

13. Special U. S. Government Requirements

13.1 The depressed areas of embossed tile shall involve no more than one third of the original, flat tile surface area prior to embossing as measured on a full tile. On embossed tile, there shall be no depressed area into which a 0.625-in. (16-mm) diameter circle can be placed, except that this shall not apply to tile that has an overall embossed surface, such as brick, slate, or other textures.

14. Keywords

14.1 laminate; monolithic; print; resilient flooring; solid vinyl; specification; tile

APPENDIX

(Nonmandatory Information)

X1. ADDITIONAL INFORMATION

X1.1 The following sources can be consulted for additional information:

X1.1.1 *ASTM Standards:*

D3564 Practice for Application of Floor Polishes to Maintain Vinyl Composition Tile or Flooring[3]

F511 Test Method for Quality of Cut (Joint Tightness) of Resilient Floor Tile[3]

F710 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring[3]

F1482 Guide to Wood Underlayment Products Available for Use Under Resilient Flooring[3]

X1.1.2 *Other Sources:* ISO 10582 Resilient floor doverings—Heterogeneous poly (vinyl chloride) floor coverings—Specification[6]

Recommended Work Procedures for Resilient Floor Covering[7]

National Motor Freight Classification[8]

Uniform Freight Classification[9]

[6] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, http://www.iso.org.

[7] Available from Resilient Floor Covering Institute, Hungerford Drive, Suite 12B, Rockville, MD 20850.

[8] Available from American Trucking Association Inc., Tariff Order Section, 1616 P Street N.W., Washington, DC 20036.

[9] Available from Uniform Classification Committee, Tariff Publishing Officers, Room 1106, 222 South Riverside Plaza, Chicago, IL 60666.