



Standard Test Method for Short-Term Indentation and Residual Indentation of Resilient Floor Covering¹

This standard is issued under the fixed designation F 1914; 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.

1. Scope

1.1 This method covers the determination of short term indentation and residual indentation of resilient nontextile floor coverings, such as vinyl plastic, linoleum, and felt-backed materials, when subjected to a concentrated load.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information only.

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.*

2. Referenced Documents

2.1 ASTM Standards:

E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method²

F 141 Terminology Relating to Resilient Floor Coverings³

F 142 Test Method for Indentation of Resilient Floor Tiles (McBurney Test)³

F 1066 Specification for Vinyl Composition Floor Tile³

F 1303 Specification for Sheet Vinyl Floor Covering with Backing³

F 1700 Specification for Solid Vinyl Floor Tile³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology F 141.

4. Significance and Use

4.1 The indentation and the residual indentation of resilient floor covering is important since the resistance and recovery from indentation reflects on the ability of the resilient floor covering to perform properly after installation.

4.2 The indentation of a resilient floor covering shall be measured using a specified type of indenter, flat or spherical, under a specified load and time.

4.3 The residual indentation of a resilient floor covering shall be measured after a specified recovery time.

4.4 See Table 1 for detailed testing and conditioning requirements by products (specification) type.

5. Apparatus

5.1 There are two types of machines used to produce indentation. The first one is as described in Test Method F 142 and is restricted to a spherical foot and it is used for initial indentation measurements only. The second one is described hereafter and has interchangeable feet with variable geometry, and it is used to measure initial indentation and the residual indentation.

5.2 Apparatus for Measuring Indentation and Residual Indentation:

5.2.1 The apparatus⁴ shall consist of an indenter acting under a dead weight, a dial indicator for measuring the depth of indentation, a rigid metal plate for supporting the specimen, and a rigid metal frame for guiding the weight and indenter. A suitable apparatus is shown in Fig. 1.

5.2.2 The indenter consists of a plunger part and a foot part. The plunger part is made of a steel bar rigidly supported vertically in such a manner that its lower end face is flat and parallel to the specimen support. The foot part of the indenter is either spherical or cylindrical with its axis perpendicular to the specimen support. The face of the indenter foot that contacts the specimen is buffed smooth to a roughness of 16 to 8 $\mu\text{in.}$ (0.4 to 0.2 μm). For standard sizes, refer to Table 1. The indenter may be either monolithic or have a detachable foot part to permit the use of varying foot sizes. The detachable foot must be attached tightly to the plunger before proceeding to the tests. The upper end of the indenter is provided with a weight-releasing device for applying the load without impact to the indenter and for activating a dial indicator from which the depth of penetration of the indenter can be read. The weight of the indenter shall be 1 ± 0.01 lb (0.45 \pm 0.05 kg).

5.2.3 The dial indicator attached to the plunger part of the indenter is equipped with a scale graduated to read the depth of indentation to 0.001 in. (0.025 mm). This dial indicator is not needed for residual indentation.

5.2.4 The metal plate for supporting the specimen shall be

¹ This test method is under the jurisdiction of ASTM Committee F-6 on Resilient Floor Coverings and is the direct responsibility of Subcommittee F06.30 on Test Methods—Performance.

Current edition approved Aug. 10, 1998. Published February 1999.

² *Annual Book of ASTM Standards*, Vol 14.02.

³ *Annual Book of ASTM Standards*, Vol 15.04.

⁴ Available from DEK-TRON Scientific Instruments, 244 East Third Street, Plainfield, NJ 07060.

TABLE 1 Sample Conditioning and Testing Procedure

Specification	Conditioning			Foot Geometry and Diameter	Total Load	Indentation Time	Recovery Time for Residual Indentation
	Temperature	Time	Medium				
F 1066	77 ± 1°F	15–30 min or 1 h	water	spherical 0.25 ± 0.0005 in. (6.35 ± 0.0127 mm)	30 ± 0.25 lb (13.6 ± 0.115 kg)	1 min	N/A
			air	spherical 0.25 ± 0.0005 in. (6.35 ± 0.0127 mm)	30 ± 0.25 lb (13.6 ± 0.115 kg)	10 min	N/A
	115 ± 1°F	15–30 min or 1 h	water	spherical 0.25 ± 0.0005 in. (6.35 ± 0.0127 mm)	30 ± 0.25 lb (13.6 ± 0.115 kg)	30 s	N/A
			air	spherical 0.25 ± 0.0005 in. (6.35 ± 0.0127 mm)	50 ± 0.5 lb (22.7 ± 0.225 kg)	5 min	60 min
F 303, Type I	75 ± 4°F	6 h	air	flat 0.25 ± 0.0005 in. (6.35 ± 0.0127 mm)	75 ± 0.75 lb (34.2 ± 0.340 kg)	15 min	60 min
F 1303, Type II	75 ± 4°F	6 h	air	flat 0.178 ± 0.0005 in. (4.521 ± 0.0127 mm)	140 ± 1 lb (63.5 ± 0.454 kg)	10 min	60 min

fixed rigidly in a horizontal position in the framework of the apparatus and shall have a smooth, flat surface.

5.2.5 An appropriate clock that will indicate the time in seconds.

6. Procedure

6.1 Test Specimen:

6.1.1 Cut a specimen of floor covering at least 2 by 2 in. (50 by 50 mm) in size if rectangular, or 2 in. (50 mm) in diameter, if circular.

6.1.2 Use a specimen the same thickness as the sample unless otherwise specified in the detail product's specification.

6.2 *Conditioning*—(see Table 1 for specific conditioning requirements).

6.2.1 There is a selection of sample conditioning. The use of air conditioning or of water immersion conditioning is defined in the detail product's specification. Immersion shall not be used if water causes the product to swell.

6.2.2 Condition and test the specimen in air maintained at 73.4 ± 3.6°F (23 ± 2°C) and 50 ± 5 % relative humidity unless otherwise specified.

6.2.3 If conditioning in water, maintain the water temperature at 77 ± 0.9°F (25 ± 0.5°C) or 115 ± 1°F (46 ± 0.5°C). Immerse the specimen for not less than 15 min or more than 30 min before testing in either air or water.

6.2.4 Do not condition or test linoleum, felt-backed, foam or rubber products in water. Do not condition or test any product in water that will swell as a result of water immersion.

6.3 Testing:

6.3.1 Use a flat indenter foot 0.178 in. (4.52 mm) in diameter unless otherwise specified. Apply the total load to the specimen detailed in Table 1.

6.3.2 Apply the load for 30 ± 2 s unless otherwise specified in the detail product's specification. For residual indentation measurements, allow the specimen to rest 60 ± 1 min between the removal of the load and the measurement of thickness. Refer to Table 1 for detailed information regarding conditioning, indenter foot geometry, total load and application time.

6.3.3 Determine the initial thickness of the specimen at the

center using the dial micrometer. Record the value to the nearest 0.001 in. (0.025 mm) as T_1 .

6.3.4 Place the specimen, with the wearing surface up, flat on the supporting plate of the apparatus. Gently lower the specified indenter foot without impact until it contacts the surface of the specimen where the initial thickness measurement was made. Set the dial indicator scale to zero. Apply the specified total load to the specimen using the weight release. Maintain the load for the required time. Read the indentation from the dial indicator after the required time has elapsed. Record the value to the nearest 0.001 in. (0.025 mm) as T_2 , then remove the weight.

6.3.5 Set the specimen aside for the required recovery time when measuring residual indentation. Measure the final thickness at the same point where the initial measurement is made. Record the value to be nearest 0.001 in. (0.025 mm) as T_3 .

6.3.6 Do not exceed 60 min total for immersion testing when water conditioning and determining indentation in accordance with Table 1.

7. Calculation and Report

7.1 Indentation:

7.1.1 Calculate the foot indentation of the specimen as follows:

$$\begin{aligned} \text{Indentation} &= T_1 - T_2 & (1) \\ \text{Indentation, \%} &= (T_2/T_1) \times 100 \end{aligned}$$

where:

T_1 = thickness of the uncompressed specimen, and
 T_2 = indentation of the specimen.

7.1.2 Test a minimum of three specimens per sample.

7.2 Residual Indentation:

7.2.1 Calculate the residual indentation of the specimen as follows:

$$\begin{aligned} \text{Residual Indentation} &= T_1 - T_3 & (2) \\ \text{Residual Indentation, \%} &= (T_1 - T_3)/T_1 \times 100 \end{aligned}$$

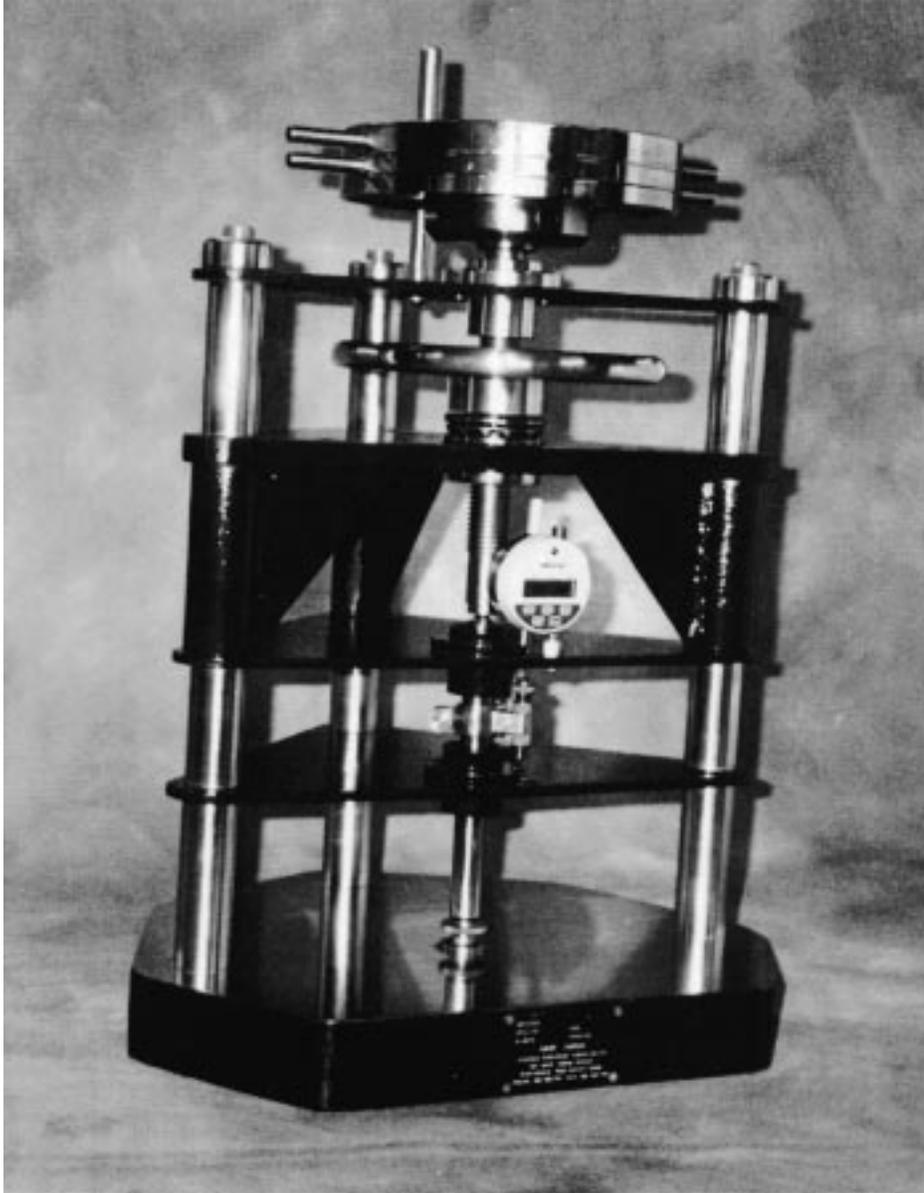


FIG. 1 Apparatus for Measuring Indentation and Residual Indentation

where:

T_1 = thickness of the uncompressed specimen, and

T_3 = thickness of the specimen after resting for the required time.

7.2.2 Test a minimum of three specimens per sample.

7.3 Report:

7.3.1 Report the average of the specimens tested as the foot indentation or the residual indentation. Record the results to the nearest 0.1 % or 0.001 in. (0.025 mm). Record the size and type of the indenter foot used, the total weight applied, the

application time, and the rest period after removing the weight.

8. Precision and Bias

8.1 The precision and bias of this test method are being determined by interlaboratory round robin in compliance with Practice E 691.

9. Keywords

9.1 indentation; resilient flooring; residual indentation

APPENDIX

(Nonmandatory Information)

X1. ADDITIONAL INFORMATION

X1.1 For further information on this test method, consult the following government standards:

Fed. Std. No. 501A (Notice 1) Federal Test Method Standard for Floor Covering, Resilient, Nontextile, Sampling and Testing⁵

Method 3221 Indentation, Flat Foot⁵

Method 3231 Indentation, Residual⁵

⁵ Available from General Services Administration, Standards Division, 7th and D Streets, SW, Room 6654 Washington, DC 20407.

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