Designation: F970 – 22

Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading[1]

This standard is issued under the fixed designation F970; 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 test method is intended for use in determining the recovery properties of uninstalled resilient floor covering after long-term indentation test, 24 h under the load specified in the detail specification. The reported value, residual indentation, is the depth of the depression remaining 24 h after removal of the specified load.

1.2 This test method is intended to evaluate ex-factory floor covering and is not intended to evaluate the performance of installed floor coverings.

1.3 This test method is not intended for use in evaluating the long-term indentation resistance or recovery properties, or both, of resilient floor coverings at loads above those listed in the Precision and Bias statement as described in Section 10.

1.3.1 Testing at loads above 250 psi is outside the scope of this test method.

1.4 Testing with any other indentor plate other than the exact plates listed in Section 4 is outside the scope of this test method.

1.5 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.

1.6 *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.*

1.7 *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]

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

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

F387 Test Method for Measuring Thickness of Resilient Floor Covering With Foam Layer

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

3. Significance and Use

3.1 This test method is a meaningful test for determining the indentation recovery properties of uninstalled resilient floor covering.[3]

3.2 This test method is intended solely for the purpose of determining compliance, where applicable, with static load requirements set forth in resilient flooring product specifications under the jurisdiction of ASTM Committee F06 on Resilient Floor Coverings.

3.3 As testing is conducted on uninstalled flooring, results are not an indicator of the floor covering's installed performance.[3]

4. Apparatus

4.1 The following apparatus shall be used:

4.2 *Conditioning Room,* providing the standard laboratory atmosphere of 50 % ± 5 % relative humidity at a temperature of 73.4 °F ± 3.6 °F (23 °C ± 2.0 °C).

4.3 *Indentation Machine,* as described in Section 12 and pictured in Fig. 2 of Test Method F1914.

4.4 *Indentor Plates,* each constructed of a piece of 2 in. (50.8 mm) square stainless steel, 0.240 in. ± 0.005 in.

[1] This test method is under the jurisdiction of ASTM Committee F06 on Resilient Floor Coverings and is the direct responsibility of Subcommittee F06.20 on Test Methods.

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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.

[3] For additional information, see Resilient Floor Covering Institute (RFCI) document, Static Limit Testing of Resilient Flooring Products, available from RFCI, 115 Broad Street, Suite 201, La Grange, GA 30240, www.rfci.com.

(6.1 mm ± 0.1 mm) thick, with one side turned to 1.125 in. (28.6 mm) in diameter (one square inch area) to depth of 0.150 in. (3.8 mm) (see Fig. 1).

4.5 *Dial Micrometer,* as described in Test Method F386 when measuring resilient floor coverings containing a foam layer as part of the construction or as described in Test Method F387 when measuring all other resilient floor coverings.

4.6 *Template of Poly(methyl Methacrylate) (PMMA),* or of other transparent material, 2 in. by 2 in. (50.8 mm by 50.8 mm) with round scratch line centered on the template that is 1.125 in. (28.58 mm) in diameter, defining the test area, and with a ½ in. (12.7 mm) diameter hole at the center of the template to draw a circle on the specimen where thickness will be measured.

4.7 *Die,* 2 in. by 2 in. (50.8 mm by 50.8 mm) and press, papercutter, or equivalent to cut specimens to 2 in. by 2 in. size (50.8 mm by 50.8 mm).

4.8 *Optional*—Open box without spring clips for 2 in. by 2 in. (50.8 mm by 50.8 mm) photographic slides, or equivalent, to separate specimens during conditioning and recovery periods.

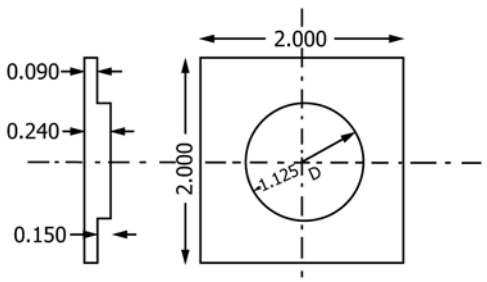
5. Sampling, Test Specimens and Test Units

5.1 The specimens shall be 2 in. by 2 in. (50.8 mm by 50.8 mm). The test unit shall consist of three specimens.

5.2 The central one square inch test area of each specimen should be free of mortar lines or other embossing lines, if possible. If not possible, the largest flat, raised area should be centered on the specimen.

5.3 If the sample is nubble embossed, the specimen should be cut so that a nub is at the center of the specimen where the specimen will be measured.

5.4 A circle slightly larger than the 0.250 in. (6.35 mm) diameter foot of the thickness gauge (4.5) is drawn on the wear layer at the center of the specimen, using the PMMA template (4.6), to ensure that thickness measurements are made at the same spot.



NOTE 1—All dimensions are in inches. Tolerance is ±0.005 in. (±0.1 mm).

Metric Equivalents:

Inches	Millimetres
2.000	50.8
1.125	28.6
0.240	6.1
0.150	3.8
0.090	2.3

FIG. 1 Indentor Plates for Static Load Limit Test

6. Conditioning

6.1 Condition the test unit at least 16 h at 73.4 °F ± 3.6 °F (23.0 °C ± 2.0 °C) and 50 % ± 5 % relative humidity and test in the same environment.

7. Procedures

7.1 Measure the initial thickness of each specimen, wear layer up, at the center of the specimen using the dial micrometer. Record the value to the nearest 0.001 in. (0.025 mm) as T_1.

7.2 Place the 2 in. by 2 in. (50.8 mm by 50.8 mm) indentor plate on top of the 2 in. by 2 in. (50.8 mm by 50.8 mm) specimen with the 1.125 in. (28.58 mm) diameter surface flat against the wear layer of the specimen.

7.3 Stack the remaining specimens and indentor plates as shown in Fig. 2. Place as many specimen/indentor plate sets under the indentation machine plunger as will fit.

7.4 Square the stack of specimen/indentor plate sets and then center the stack under the plunger of the indentation machine.

7.5 Check all clearances to be sure that the plunger and major load shaft with weight platform and weights will be free to move down without restriction as the height of the stack of specimens diminishes during test. If necessary, place a metal spacer above or below the plunger, and adjust the position of the collar on the plunger that supports a dial indicator (not used for static load test) to ensure adequate clearances during test.

7.6 Apply the load according to the detail specification (75, 125, 175, or 250 lb) by lowering gently, without impact.

7.7 Remove the load after 24 h ± 0.25 h and separate the specimens from the indentor plates. Place the specimens individually on a horizontal surface with the wear layer up or on edge in a slide box to recover .

7.8 Allow specimens to recover for 24 h ± 0.25 h. Measure the final thickness at the same point used to determine initial thickness. Record the value to the nearest 0.001 in (0.025 mm) as T_2.

8. Calculation

8.1 Calculate the residual indentation for each specimen as follows:

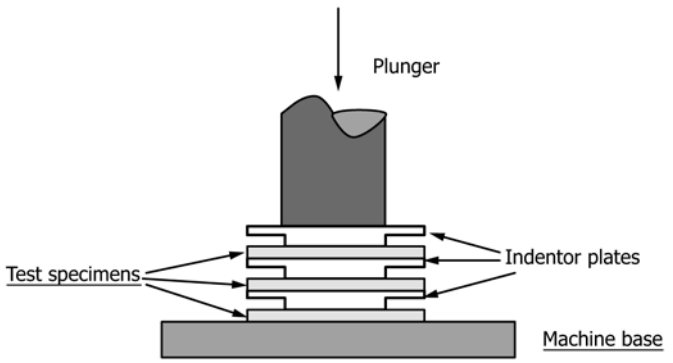


FIG. 2 Test Specimen Stacking Procedure

$$\text{Residual indentation} = T_1 - T_2 \quad (1)$$

where:

T_1 = initial thickness of uncompressed specimens, and
T_2 = thickness of the specimen after the 24 h recovery period.

9. Report

9.1 Report the following information:

9.1.1 Complete identification of the product tested including type, source and manufacturer's reference numbers,

9.1.2 The applied load,

9.1.3 The residual indentation for each specimen, and

9.1.4 The average residual indentation.

10. Precision and Bias[4]

10.1 *Precision Statement for Test Method: 75 psi*—Precision, characterized by repeatability, *Sr, r*, and reproducibility, *SR, R*, has been determined for the materials to be:

Materials	*Average*	*Sr*	*SR*	*r*	*R*
Material A	1.2900	0.4606	0.7244	1.2897	2.0283
Material B	1.8383	0.7251	0.9941	2.0302	2.7835
Material C	2.5400	0.6315	1.6225	1.7683	4.5431
Material D	0.7817	0.3405	1.2443	0.9533	3.4841
Material E	1.0283	0.4295	0.5103	1.2027	1.4289
Material F	1.2583	0.3515	0.8906	0.9842	2.4938
Material G	1.1517	0.3130	0.5485	0.8765	1.5357
Material H	0.8050	0.4396	0.7639	1.2309	2.1389

10.2 *Precision Statement for Test Method: 125 psi*—Precision, characterized by repeatability, *Sr, r*, and reproducibility, *SR, R*, has been determined for the materials to be:

Materials	*Average*	*Sr*	*SR*	*r*	*R*
Material A	1.5650	0.4410	0.6230	1.2347	1.7444
Material B	2.4700	0.7770	0.9865	2.1755	2.7621
Material C	3.6150	0.5257	1.5327	1.4719	4.2916
Material D	0.9133	0.3177	1.1233	0.8897	3.1453
Material E	1.2967	0.3782	1.3130	1.0590	3.6765
Material F	2.0967	0.6213	1.1458	1.7395	3.2082
Material G	1.2500	0.4299	0.6220	1.2036	1.7415
Material H	0.8867	0.3490	0.8310	0.9772	2.3267

10.3 *Precision Statement for Test Method: 175 psi*—Precision, characterized by repeatability, *Sr, r*, and reproducibility, *SR, R*, has been determined for the materials to be:

Materials	*Average*	*Sr*	*SR*	*r*	*R*
Material A	2.3050	0.4881	0.5336	1.3667	1.4941
Material B	2.9000	0.8636	0.9125	2.4181	2.5550
Material C	4.5833	0.8461	1.7083	2.3690	4.7833
Material D	0.7817	0.5179	0.9264	1.4501	2.5939
Material E	1.3067	0.5465	0.7144	1.5301	2.0003
Material F	3.0000	0.6880	1.2707	1.9264	3.5579
Material G	1.2733	0.3723	0.5720	1.0425	1.6016
Material H	1.2317	0.4331	0.6054	0.2127	1.6951

10.4 *Precision Statement for Test Method: 250 psi*—Precision, characterized by repeatability, *Sr, r*, and reproducibility, *SR, R*, has been determined for the materials to be:

Materials	*Average*	*Sr*	*SR*	*r*	*R*
Material A	3.4117	0.6008	2.1059	1.6822	5.8965
Material B	3.4600	0.8773	1.8846	2.4565	5.2769
Material C	6.9933	0.7898	5.4767	2.2115	15.3348
Material D	0.5700	0.5293	0.6072	1.4820	1.7002
Material E	2.1433	0.4278	1.9323	1.1978	5.4104
Material F	4.7667	0.6069	2.3446	1.6993	6.5650
Material G	3.1017	0.5088	1.7970	1.4245	5.0315
Material H	1.8033	0.5975	0.7532	1.6730	2.1089

10.5 *Material Identification:*

Material A—Type I, Grade 3 Floor Covering
Material B—Type I, Grade 3 Floor Covering High Blow Ratio Foam Layer
Material C—Type I, Grade 3 Double Felt, Double Foam, Wear Layer/Compact Coat
Material D—Type II, Grade 1 Homogeneous Commercial Floor Covering
Material E—Type I, Grade 1, Floor Covering with Urethane Top Coat
Material F—Type I, Grade 1 Floor Covering
Material G—Type I, Grade 2 Floor Covering
Material H—Type II, Grade 1 Floor Covering

10.6 In the tables in 10.1 – 10.4, for the materials indicated:

average = numerical average of test results for all replicates from all laboratories,

Sr = within-laboratory standard deviation of the average,

r = 2.83 *Sr*,

SR = between-laboratory standard deviation of the average,

R = 2.83 *SR*,

repeatability (Sr, r) = in comparing two average values for the same material obtained by the same operator using the same equipment on the same day, the means should be judged not equivalent if they differ by more than the r value for that material and condition, and

reproducibility (SR, R) = in comparing two average values for the same material obtained by different operators using different equipment on different days, the means should be judged not equivalent if they differ by more than the *R* value for that material and condition. (This applies between different laboratories or between different equipment within the same laboratory.)

These judgments will have an approximate 0.95 (95 %) probability of being correct. Other materials may give somewhat different results. For further information on the methodology used in Section 10, consult Practice E691.

11. Keywords

11.1 flooring; recovery; residual indentation; resilient; static load

[4] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:F06-1005.