



Designation: F 137 – 71 (Reapproved 1994)^{ε1}

Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus¹

This standard is issued under the fixed designation F 137; 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.

^{ε1} NOTE—Keywords were added in September 1994.

1. Scope

1.1 This test method covers the determination of the flexibility of resilient flooring materials by means of cylindrical mandrel apparatus. It is especially applicable to sheet goods and some tiles.

2. Significance and Use

2.1 Flexibility is that property of a material which allows it to be deformed by bending or rolling without cracking, breaking, or other permanent defects, using whatever force is necessary to bend or roll it. Flexibility is an important characteristic of flooring in that it provides for ease of handling in rolling, cutting, and fitting.

3. Apparatus

3.1 *Flexibility Test Equipment*, consisting of mandrels, that is, cylindrical rods with circular cross sections having outside diameters from 10 to 120 mm ($\frac{1}{2}$ in. to 5 in.) in 10-mm ($\frac{1}{2}$ -in.) increments. The contacting faces of the rods shall be a minimum of 60 mm ($2\frac{1}{2}$ in.) in length.

3.2 *Stand or Other Device*, to firmly support the mandrel in a horizontal position during the test.

3.3 *Conditioning Area*, capable of maintaining $23 \pm 1^\circ\text{C}$ ($73.4 \pm 1.8^\circ\text{F}$) and $50 \pm 5\%$ relative humidity.

3.4 *Die or Knife* or similar instrument to prepare test specimens with uniform smooth edges.

4. Test Specimen

4.1 The test specimens shall consist of a portion of the material 50 ± 1.27 mm (2 ± 0.05 in.) wide and at least 225 mm (9 in.) long.

4.2 Prepare the specimen by means of a die, knife, or other similar instrument so as to produce uniform smooth edges. Specimens with nicked or fractured edges should not be tested.

5. Conditioning

5.1 Condition the test specimens for at least 24 h at $23 \pm$

1°C ($73.4 \pm 1.8^\circ\text{F}$) and $50 \pm 5\%$ relative humidity, and test in the same environment. Alternatively, testing may be performed at room temperature in an uncontrolled environment if carried out within 5 min.

5.2 Specimens must be conditioned on a flat surface. If necessary, they can be weighted to remove all curvature.

6. Procedure

6.1 In the actual flexing of the specimen, place the specimen over a mandrel with the wearing surface face out and the major axis of the specimen perpendicular to the major axis of the mandrel.

6.2 Holding the specimen at each end, bend the material around the mandrel through an angle of 180° at a uniform rate so as to require 3 to 5 s to complete the bend. Maintain a good contact between specimen and mandrel.

6.3 At the completion of the bending operation, examine the specimen face visually in the bent position for breaks, cracks, or other damage. When required by the detailed specification, straighten the specimen at the same rate at which it was bent and examine the back for the same faults.

6.4 When a mandrel of particular diameter has been specified, as for a purchase specification, use that mandrel.

6.5 When no particular mandrel has been specified, determine the smallest mandrel around which the material may be bent without showing breaks, cracks, or other damage. To do this, estimate the size of the mandrel over which the specimen will not break. Then use a series of mandrels, each one consecutively smaller than the first, until breaks or cracks are exhibited. Start with a fresh specimen for each separate flex.

6.6 The exact number of test on a specified mandrel (6.4) or of the smallest mandrel around which the material will not break (6.5) shall be as specified in the given specification. In any case, make at least two separate determinations with the long dimension of the specimen parallel to the machine direction or grain of the material and two separate determinations with the long dimension perpendicular to the machine direction of the material.

NOTE 1—When the machine direction cannot be determined by the appearance of the material, two specimens shall be cut parallel to one edge of the material and two perpendicular to that set. Report that a machine

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