

Standard Test Method for Squareness of Resilient Floor Tile by Dial Gage Method¹

This standard is issued under the fixed designation F 540; 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 covers the measurement of the squareness of resilient floor tile. The test method consists of measuring the amount each corner of the tile deviates from 90°.

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. Significance and Use

2.1 The squareness of resilient floor tile is an important consideration because the installed flooring will have an objectionable appearance if the angles of the four corners deviate excessively from 90°. This condition may cause the installed tiles to line up unevenly, producing unsightly seams and corners that do not match.

3. Apparatus

3.1 The apparatus shall consist essentially of a dial gage and two index strips mounted on a flat bedplate so as to form an angle of 90° (Fig. 1) and a reference gage to set the dial indicator at zero (Fig. 2).

3.1.1 *Dial Gage*—The dial gage is mounted in a horizontal guide slot located in the lower left-hand corner of the bedplate. The slotted guide dimensions shall be sufficient to facilitate positioning of the dial gage. The dial gage is mounted so that the stem will travel in a direction parallel to the horizontal index strip and is positioned so that the contact foot will extend past the inner edge of the vertical index strip by 0.125 ± 0.02 in. (3.18 ± 0.5 mm) when the stem is fully extended. The dial indicator is graduated to read 0.001 in. (0.02 mm) and has a total stem travel of 1 in. (25.4 mm). The cylindrical contact foot of the indicator includes a flat face 0.25 ± 0.01 in. (6.35 ± 0.25 mm) in diameter and exerts a total force on the specimen of not more than 3 ozf (0.83 N).

3.1.2 *Index Strips*—One of the index strips for holding the specimen in proper position is located horizontally along the bottom of the base plate, and the other is attached on the left side of the plate and at an angle of $90^\circ \pm 10$ s (1.57080 ± 0.00005 rad. to the horizontal strip. The lower end of the index strip on the left-hand side is $\frac{1}{2}$ to $\frac{3}{4}$ in. (12.7 to 19.1 mm) above the horizontal strip to permit the stem of the dial indicator to project between the two strips, so that the foot contacts the edge of the tile near the corner.

3.1.3 *Reference Gage*—A right-angle reference gage of $90^\circ \pm 10$ s (1.57080 ± 0.00005 rad.) with 12-in. (305-mm) legs is required for setting the dial indicator to zero and checking the angle of the index strips (Fig. 2).

4. Hazards

4.1 Take care to seat the specimen properly against the horizontal and vertical index strips.

4.2 Check the zero setting of the dial gage indicator prior to and frequently during use.

4.3 Remove all foreign matter and loose particles from the edges of the specimen and from the index guides prior to measurement.

5. Specimen

5.1 The specimen shall consist of a tile from the test unit.

6. Conditioning

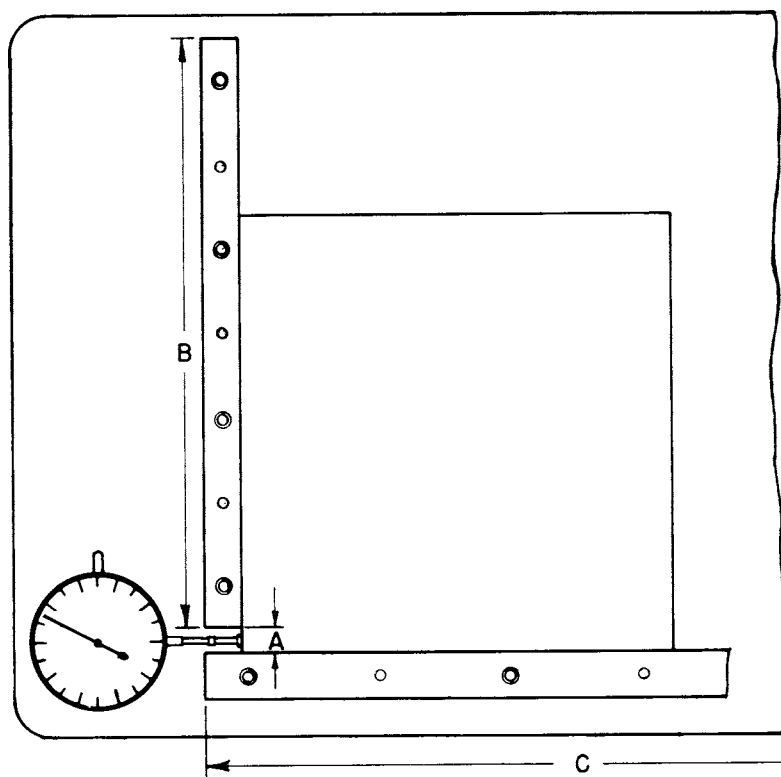
6.1 Condition the test specimens at least 4 h at $73.4 \pm 1.8^\circ\text{F}$ ($23 \pm 1^\circ\text{C}$) and $50 \pm 5\%$ relative humidity, and test in the same environment.

7. Procedure

7.1 *Adjustment of Apparatus*—Prior to setting the dial gage indicator to zero, check the position of the contact foot to make certain that it extends the required distance past the vertical index strip. If it does not, adjust the position of the dial gage in the slotted guide accordingly and secure it to the bedplate. For zero setting of the dial indicator and checking the alignment of the vertical and horizontal index strips, place the reference gage (Fig. 2) on the bedplate of the apparatus approximately 1 in. (25 mm) away from each of the two index strips. Slide the reference gage into firm contact with each of the two index strips and the contact foot. The reference gage should fit evenly against each index strip. The dial gage stem should be retracted with the flat face of the contact foot resting evenly on the

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	Dimension, in. (mm)	Tolerance, in. (mm)
A	$\frac{5}{16}$ (15.9)	$\frac{1}{8}$ (3.2)
B	13 (330)	nominal
C	13 (330)	nominal

FIG. 1 Squareness Measuring Apparatus

reference gage. If alignment is not correct, adjust the strip(s) or dial gage, or both, accordingly. After the required alignment has been established, set the dial gage indicator at zero and lock into position. Remove the reference gage from the apparatus.

7.2 Measuring the Specimen—Place the tile on the bedplate face up with the bottom edge in contact with the horizontal index strip and the left-hand edge approximately 1 in. (25 mm) to the right of the vertical index strip. While maintaining contact with the horizontal index strips, gently slide the tile to the left until it contacts the vertical index strip. Maintain light pressure on the tile to ensure contact with both index strips and read the out-of-square value from the dial indicator to the nearest 0.001 in. (0.02 mm). Repeat the procedure on the remaining three corners by turning the tile 90° for each measurement. Remove the tile from the bedplate and reverse it so that it may now be placed face down on the bedplate and measure the out-of-squareness of all four corners in accordance with the foregoing procedure.

8. Results

8.1 Depending on the tile size, it is recommended that a minimum of three 12 by 12-in. (305 by 305-mm) or five 9 by 9-in. (228.6 by 228.6-mm) tile be measured to determine out-of-squareness for each unit and that these tiles be selected at random from the lot to be tested.

8.2 The out-of-square of the test unit shall be the greatest of all of the maximum absolute values obtained from the specimens tested.

8.3 Record the out-of-square of the test unit to the nearest 0.001 in. (0.02 mm).

9. Precision and Bias

9.1 Precision²—The precision and bias for this test method was determined on 12 by 12 in. (304.8 by 304.8 mm) tiles. Results for tiles of other sizes may be different.

9.1.1 Precision Statement, Squareness—Precision, characterized by repeatability, S_r , r , and reproducibility, S_R , R has been determined for the materials tested to be:

Materials	Average	S_r	S_R	r	R
A	2.06	0.71	1.46	1.98	4.09
B	1.89	0.35	1.18	0.99	3.32
C	2.53	0.41	1.14	1.14	3.18
D	12.33	0.67	2.84	1.87	7.96
E	22.06	0.71	3.24	1.98	9.09

9.2 Bias—The bias of this test method has not been determined.

² Supporting data have been filed at ASTM Headquarters and may be obtained by requesting Report RR: F06-1004. Data based on 12 by 12 in. tiles only.