Designation: D 5672 – 95

Standard Test Method for Testing Flexible Cellular Materials Measurement of Indentation Force Deflection Using a 25-mm (1-in.) Deflection Technique[1]

This standard is issued under the fixed designation D 5672; 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 a screening type quality control test used to determine if flexible polyurethane foam cushions are within the specified grade range for firmness.

1.2 This test method is limited to foams with thicknesses that are 75 mm (3 in.) or greater.

1.3 This test method is based on the fact that the traditional industry standard thickness for Indentation Force Deflection (IFD) is 100 mm (4 in.), and the traditional percent deflection for IFD acceptance and product planning is 25 %. With respect then to these traditional industry conventions, a 25 % deflection on a 100-mm (4-in.) cushion would be 25 mm (1 in.). Thus, deflecting proper thickness cushions 25 mm (1 in.) will determine if the flexible polyurethane foam is within the specified grade range for 25 % IFD.

1.4 Cushion thicknesses less than 75 mm (3 in.) shall not be tested for IFD using this test method.

1.5 This test method is intended to provide a quick and simple method to screen flexible polyurethane foams for determination of grade.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 3574 Methods of Testing Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams[2]

D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries[2]

2.2 Method for IFD, Chapter 4.0, "Flexible Polyurethane Foam Standards and Guidelines," Joint Industry Foam Standards and Guidelines Committee[3]

3. Terminology

3.1 This test method is an extension of Methods D 3574, Test B_1. Refer to Methods D 3574 for terminology used in this Test Method.

4. Significance and Use

4.1 The 25-mm (1-in.) deflection IFD method is recommended for production screening and quality control on full size cushions only.

4.2 Applicable cushion thicknesses to be tested by this test method are to be only those listed in this test method. Further research and development are required before this test method will be applicable to other cushion thicknesses.

4.3 This test method is designed to give a test value approximate to the IFD on a 100-mm (4-in.) thick piece of foam when the actual thickness to be tested is within the ranges listed in the test method. In case of disagreement, the referee method is the IFD procedure in Methods D 3574, Test B_1. The user of this test method shall establish the correlation between this test method and the referee method.

5. Apparatus

5.1 The apparatus used for determining IFD in Methods D 3574 is used for this test method.

6. Conditioning

6.1 The conditioning conditions described in Methods D 3574 are best used when using this test method; however, since this method is a screening type test method, precise conditioning may not be practical.

6.2 It should be realized that since IFD is very sensitive to temperature and humidity, testing samples that have been exposed to extreme conditions of humidity and temperature should be avoided. Simply placing the specimens to be tested into an air-conditioned room in the summer or a heated room in the winter and allowing them to equilibrate with the cooled or heated room air for several hours will alleviate some of the problems associated with extreme weather conditions.

7. Procedure

7.1 *For test specimens 75 mm (3 in.) to 100 mm (4 in.) in thickness*:

[1] This test method is under the jurisdiction of ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.22 on Cellular Plastics.
Current edition approved Feb. 15, 1995. Published April 1995.

[2] *Annual Book of ASTM Standards*, Vol 09.02.

[3] Available from AFMA, P.O. Box HP-7, High Point, NC 27261.

7.1.1 Length and width of the test specimens shall be a minimum 610 mm by 610 mm (24 in. by 24 in.). Using the indentor foot, measure the original height of the foam specimen using the 4.5-N (1-lb) preload procedure in Methods D 3574. Then preflex the test specimen 75 % of its original thickness two times. Before removing the test specimen from under the indentor foot and while the indentor foot still loads the specimen to 4.5 N (1 lb), draw the diameter of the indentor foot on top of the test specimen using a felt tip marker. When circumscribing the indentor foot on the test specimen, be certain that the test specimen is not moved laterally in any direction from the exact location where it was preflexed with the indentor foot. The circumscribed circle will be used for exact relocation of the indentor foot after the required waiting period. After preflexing, a waiting period of 6 ± 1 min is to be observed before performing the 25-mm (1-in.) deflection IFD.

7.1.2 The preflex indentation speed, the indentor foot, and the final indentation speed are the same as specified in Methods D 3574.

7.1.3 After the 6-min waiting period, measure the test specimen height by using the 4.5-N (1-lb) preload procedure in Methods D 3574. Indent the indentor foot into the foam exactly 25 mm (1 in.) and after 60 ± 3 s read the 25 mm (1 in.) deflection IFD from the force gage in N (lb).

7.2 For test specimens 100 mm (4 in.) to 165 mm (6.5 in.) in thickness:

7.2.1 On 100 mm (4 in.) to 165 mm (6.5 in.) thickness test specimens, the amount of deflection during preflexing shall be 75 mm (3 in.). Carry out all other parts of the test as described in Section 6 and in Methods D 3574.

7.3 It has been demonstrated that adherence to all details specified herein or referenced herein, or both, is necessary to obtain good correlation between this test method and the Methods D 3574 IFD method. Small deviations in test procedures and conditions can produce large variances in test results in this and other tests on flexible polyurethane foams.

8. Precision and Bias

8.1 Precision and bias testing is being conducted according to Practice D 4483.

9. Keywords

9.1 flexible cellular; foam hardness