



Designation: C 421 – 05

Standard Test Method for Tumbling Friability of Preformed Block-Type Thermal Insulation¹

This standard is issued under the fixed designation C 421; 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.

1. Scope

1.1 This test method covers determination of the mass loss of preformed block-type thermal insulation as a result of a combination of abrasion and impact produced by a laboratory tumbling mechanism.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values 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:*²

C 167 Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations

C 168 Terminology Relating to Thermal Insulation

C 303 Test Method for Dimensions and Density of Preformed Block and Broad-Type Thermal Insulation

3. Terminology

3.1 *Definitions*—Definitions pertaining to thermal insulating materials are defined in Terminology C 168.

4. Significance and Use

4.1 Several test methods for measuring mass loss by abrasion and impact of preformed block-type thermal insulation have been used to some extent in the past. It is believed that no single test method completely covers all factors involving such forces for different kinds of materials, but this test method is intended to provide a procedure that gives reproducible results.

It is used for comparing the mass loss by tumbling before and after a specific treatment of the insulation, as agreed upon by the purchaser and the manufacturer.

5. Apparatus

5.1 *Box*—A cubical box of oak wood, having inside dimensions of $7\frac{1}{2}$ by $7\frac{3}{4}$ by $7\frac{3}{4}$ in. (190 by 197 by 197 mm), mounted rigidly at the center of one $7\frac{3}{4}$ by $7\frac{3}{4}$ in. (197 by 197 mm) end, so that the axis normal to a face of the box is that of a rotatable horizontal shaft. One side of the box shall be hinged as a door and shall be gasketed to be dust-tight. The box shaft shall be motor driven at a constant speed of 60 ± 2 r/min.

5.2 *Cubes*—Twenty-four room-dry, solid oak, $\frac{3}{4} \pm \frac{1}{32}$ -in. (19 ± 0.8 -mm) cubes shall be placed in the box with the test specimens. The specific gravity of the oak cubes shall be approximately 0.65; white oak meets this requirement.

NOTE 1—Number each group of wood cubes 1 through 24. At the end of every 600-revolution test, remove one “used” cube (follow the number sequence and remove the oldest cube) and replace with a correspondingly numbered “new” cube. In this manner, cube wear is eliminated as an uncontrolled variable in the test method. When the corners of the wood cubes have been worn so that the radius of curvature is greater than $\frac{1}{16}$ in. (1.6 mm) or the cubes have become altered so as not to be comparable with new cubes, they shall be discarded and new ones used. A conventional machinist’s radius gage is used for checking the edge wear.

6. Test Specimens

6.1 Cut the insulation with a fine-tooth saw (similar to a 16-tooth band saw) into $1 \pm \frac{1}{16}$ -in. (25.4 ± 1.6 -mm) cubes.

6.2 Test twelve cubes at a time cut from one piece of insulation. When flat insulation has special surfaces due to treatment or molding, cut each cube to include such special surfaces as one face, except that the edges and corners of the insulation shall not be used.

6.3 Dry and condition specimens prior to test, following applicable specifications for the material. If the material is adversely affected by oven temperatures, then condition specimens for not less than 40 h at $73.4 \pm 1.8^\circ\text{F}$ ($23 \pm 1^\circ\text{C}$), and $50 \pm 5\%$ relative humidity before testing. In the absence of definitive drying specifications, dry specimens in an oven at 215 to 250°F (102 to 121°C) to constant mass, and hold in a desiccator to cool to room temperature before testing. Where

¹ This test method is under the jurisdiction of ASTM Committee C16 on Thermal Insulation and is the direct responsibility of Subcommittee C16.32 on Mechanical Properties.

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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.