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*Indian Standard*

**METHOD OF TEST FOR TUMBLING FRIABILITY  
OF PREFORMED BLOCK-TYPE THERMAL  
INSULATION**

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**INDIAN STANDARDS INSTITUTION**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# Indian Standard

## METHOD OF TEST FOR TUMBLING FRIABILITY OF PREFORMED BLOCK-TYPE THERMAL INSULATION

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( *Continued on page 2* )

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( Continued from page 1 )

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# *Indian Standard*

## METHOD OF TEST FOR TUMBLING FRIABILITY OF PREFORMED BLOCK-TYPE THERMAL INSULATION

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 1 October 1984, after the draft finalized by the Thermal Insulation Materials Sectional Committee had been approved by the Chemical Division Council.

**0.2** Several methods for measuring loss of mass by abrasion and impact of preformed block-type thermal insulation materials have been used to some extent in the past. It is felt that no single method completely covers all factors involving such forces for different kinds of materials. But this method is intended to provide a procedure that will give reproducible results. It may be used for comparing the loss of mass by tumbling before or after a specific treatment of the insulation.

**0.3** In the preparation of this standard considerable assistance has been derived from ASTM C 421-77 'Test method for tumbling friability of preformed block-type thermal insulation', issued by the American Society for Testing and Materials.

**0.4** In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960\*.

### 1. SCOPE

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

### 2. TERMINOLOGY

**2.1** For the purpose of this standard, the definitions of terms, symbols and units given in IS : 3069-1965†, and the following shall apply.

\*Rules for rounding off numerical values (*revised*).

†Glossary of terms, symbols and units relating to thermal insulation materials.

**2.1.1 Friability** — The percentage loss in mass under the condition of test.

### **3. APPARATUS**

**3.1 Box** — A cubical box of teak wood, having inside dimensions of  $190 \times 197 \times 197$  mm, mounted rigidly at the centre of one  $197 \times 197$  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.

**3.2 Rotator** — The box shaft shall be motor driven at a constant speed of  $60 \pm 2$  rpm.

**3.3 Cubes** — Twenty-four room-dry, solid teak wood,  $19 \pm 0.8$  mm cubes shall be placed in the box with the test specimens. The specific gravity of the teak wood cubes shall be approximately 0.65.

**3.4 Sieve** — A 9.5 mm, mesh sieve.

### **4. TEST SPECIMEN**

**4.1** Cut the insulation with a fine-tooth saw into  $25.4 \pm 1.5$  mm cubes. Test 12 cubes at a time cut from one piece of insulation. When flat insulation has special surfaces due to treatment or moulding, cut each cube to include such special surfaces as one face, except that the edges and corners of the insulation shall not be used.

### **5. PROCEDURE**

**5.1 Conditioning** — Dry the specimens to constant mass in a vented oven at a temperature of  $110 \pm 5^\circ\text{C}$ , and hold in a desiccator to cool to room temperature before testing. When drying at this temperature is destructive to the insulation, dry to constant mass at a suitable temperature. Conduct the test in an atmosphere of  $27 \pm 2^\circ\text{C}$  and  $65 \pm 5$  percent relative humidity.

**5.2** Weigh the twelve conditioned test specimens on a balance within  $\pm 1$  percent. Place the twelve specimens together with one set of 24 numbered (1 to 24) teak wood cubes in a clean test box and secure lid tightly.

**5.3** Rotate the box at  $60 \pm 2$  rpm for  $600 \pm 3$  revolutions. Immediately after the test period, carefully dump the contents of the box on to a 9.5 mm sieve and tap gently to remove dust and fine particles. Carefully remove the twelve largest pieces of insulation from the sieve and weigh promptly.



## 6. CALCULATION

6.1 Calculate the friability using the following expression:

$$\text{Friability, percent} = \frac{100 (M_1 - M_2)}{M_1}$$

where

$M_1$  = original mass in g of the set of test specimens, and

$M_2$  = final mass in g of the set of test specimens.

## 7. REPORT

7.1 The report shall include the following:

- a) Reference to this standard;
- b) Description and identification of the test specimen;
- c) Percentage mass lost;
- d) Comments on the mode and extent of abrasion, erosion, crumbling, cracking, etc; and
- e) Any deviation from the specified test procedure.