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भारतीय मानक मसौदा

ऊष्मारोधन मिल बोर्ड — विशिष्टि

(आई एस 14539 का प्रथम पुनरीक्षण)

DRAFT Indian Standard

Insulation Mill Board — Specification

(First Revision of IS 14539)

ICS 29.035

**Gasket and Packing Sectional
Committee, MED 30**

**Last date for receipt of comments
is 18 November 2022**

FOREWORD

(Adoption clause to be added later)

This standard was first published in 1998.

Major changes in this revision are as follows:

- a) The international classification for standards (ICS) number has been updated;
- b) Terminologies have been added;
- c) Tolerance on dimensions have been revised;
- d) Characteristics of insulation mill board have been revised; and
- e) Compressibility and recovery test, a characteristic gasket property has been removed.

The composition of the Committee responsible for the formulation of this standard is given in Annex *(to be added later)*.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values *(second revision)*’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

DRAFT Indian Standard

INSULATION MILL BOARD — SPECIFICATION

(*First Revision*)

1 SCOPE

This standard covers insulation mill board having low contents asbestos fibres used for thermal insulation, acoustic insulation, electric insulation, and for gaskets.

2 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

2.1 Asbestos — Asbestos is a collective name given to naturally occurring fibrous silicate material. The most commonly used is chrysotile fiber.

2.2 Gasket — Deformable material (or combination of materials) intended to be clamped between flanges to prevent leakage of contained fluid.

3 DIMENSIONS

The length and width of the sheets shall be as agreed between the manufacturer and the purchaser.

3.1 The recommended nominal thicknesses of insulation mill board are as follows:

1.5, 2, 3, 4, 5, 6, 8, 10 and 12.5 mm

NOTE — Insulation mill board can be manufactured in other thicknesses as agreed between the manufacturer and the purchaser.

3.2 The maximum variation ‘A’ of any sheet from the nominal thickness and the maximum permissible variation ‘B’ in thickness between any two points not more than 250 mm apart shall be given as follows:

<i>Sl No.</i>	<i>Nominal Thickness</i>	<i>Variation A</i>	<i>Variation B</i>
(1)	(2)	(3)	(4)
i)	Over 1.0 upto and including 3.0	±0.15	±0.10
ii)	Over 3.0 upto and including 5.0	±0.30	±0.20
iii)	Over 5.0 upto and including 8.0	±0.50	±0.50
iv)	Over 8.0 upto and including 12.5	±1.00	±1.00

4 WORKMANSHIP

4.1 Insulation mill board sheets shall be smooth, free from cracks, dents as well as foreign particles. The edges of the sheets should be evenly cut.

4.2 The quality characteristics of the insulation mill board, when tested at ambient temperature, shall meet the requirements specified in Table 1.

5 SAMPLING

Unless otherwise agreed to between the purchaser and the manufacturer, the sampling plan and criteria for conformity as given in **5.1**, **5.2**, and **5.3** shall be followed.

5.1 Lot

In any consignment all the sheets of same grade and dimensions manufactured under essentially similar conditions of production shall be grouped together to constitute a lot.

5.2 Material shall be submitted for acceptance in lots weighing not more than 3 000 kg including sheets of the same dimensions. The number of samples to be selected at random for dimensional conformity shall be according to the Table 2.

Table 1 Quality Characteristics of Insulation Mill Board
(Clause 4.2)

Sl No.	Requirements	Characteristics
(1)	(2)	(3)
i)	Colour	Off white
ii)	Density	1.0-1.3 g/cm ³
iii)	Tensile strength in either direction	Along the grain: 15 kgf/cm ² , <i>Min</i> Across the grain: 10 kgf/cm ² , <i>Min</i>
iv)	Water contents	2 percent, <i>Max</i>
v)	Loss on ignition	18 percent, <i>Max</i>
vi)	pH of water extract	7.0 to 8.5 traces
vii)	Chloride (Cl) and Sulphate (SO ₄)	It shall not catch fire
viii)	Fire proofness	15 percent, <i>Min</i>
	a) Compressibility	40 percent, <i>Max</i>
	b) Recovery	30 percent, <i>Min</i>

NOTE — The pH value of the water extract and presence of Cl and SO₄ should not serve as grounds for rejections.

Table 2 Sampling Plan
(Clause 5.2)

Sl No.	No. of Pieces in the Lot	For Dimensions	
(1)	(2)	(3)	(4)
i)	Up to 500	5	0
ii)	501 to 2 000	8	0
iii)	2 001 and above	13	1

5.3 Three sheets shall be selected from a lot for carrying out the tests like thickness, chemical, physical and mechanical properties.

5.4 If any sample fails to comply with the requirements of any test other than dimensions, double the number of samples shall be selected from the same batch for retest and each of them shall comply with the requirement of that test.

6 TEST METHODS

The selected sheets of insulation mill board shall be cut along mutually perpendicular directions into four equal parts rectangular in shape and then two of these parts located along the same diagonal shall be tested.

6.1 Conditioning

All specimen shall be conditioned as described in Annex A before testing.

6.2 Dimensions

The length and width of sheets shall be checked with the aid of a metal tape/rule to the nearest 1 mm. The thickness of the sheets shall be determined with the aid of a dead weight micrometer with an anvil of 10 mm in diameter by measuring the thickness of two cut parts of the sheet at four points along the perimeter of each part of the sheets. Measurements shall be taken to the nearest 0.1 mm and at a distance of not less than 20 mm from the edge of the sheet. The arithmetic mean of all the measurements shall be considered to be the thickness.

6.3 Density

A test piece of 100 mm × 100 mm shall be weighed nearest to 0.1 g and its thickness ascertained according to 3.2. The mass of test piece in ‘g’ divided by its volume in ‘cm³’ gives the density.

6.4 Tensile Strength

The tensile strength shall be determined by the method described in Annex B.

6.5 Water Contents Test

The water contents shall be determined by the method described in Annex C

6.6 Loss on Ignition Test

The loss on ignition shall be determined by the method described in Annex D.

6.7 pH of Water Extract Test

The pH of water extract shall be determined by the method described in Annex E.

6.8 Chloride and Sulphate Contents Test

The chloride and sulphate contents in the water extract shall be determined by the method described in Annex F.

6.9 Fire Proofness

Insulation mill board shall not catch fire on burning the sheet in fire.

7 MARKING

7.1 Each sheet shall be marked with the date of manufacture, code, and manufacturer's brand name.

7.2 BIS Certification Marking

The product may also be marked with the Standard Mark.

7.2.1 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations made thereunder. The details of conditions under which a license for the use of Standard Mark may be granted to the manufacturers or the producers may be obtained from the Bureau of Indian Standards.

8 PACKING

Insulation mill board sheet may be supplied flat, suitably packed to prevent damage as per the requirement of the purchaser.

ANNEX A *(Clause 6.1)*

METHOD OF CONDITIONING

A-1 The specimen shall be conditioned in an oven at 105 °C to 110 °C for 2 h and allowed to cool at room temperature for two to three hours in a desiccator containing anhydrous calcium chloride or silica gel.

ANNEX B
(Clause 6.4)

METHOD OF DETERMINING TENSILE STRENGTH

B-1 Four test strips 300 mm long and 25 mm wide shall be cut or stamped from two parts of a sheet at a distance of at least 10 mm from the edge (two strips in mutually perpendicular directions from each part of the sheet). The strip shall be free from mechanical damage. Each specimen shall be provided with an arrow indicating the direction in which the strip was cut. The test piece shall be conditioned as described in **6.1**.

B-2 The tensile strength shall be determined by testing these strips in suitable tensile testing machine. The distance between the clamps shall be equal to 200 mm and the lower clamp shall move at a rate of 50 mm/ min. After testing specimen, the thickness and width of cross section should be measured by a micrometer/ thickness gauge.

B-3 The tensile strength, s (kgf/cm²) shall be determined as:

$$s = \frac{P}{A}$$

where

P = Breaking load in kgf; and

A = Cross-sectional area of specimen in cm².

B-4 The tensile strength of insulation mill board sheet for each direction shall be calculated as the arithmetic mean of the test results obtained on four strips.

NOTE — If the rupture of the specimen occurs at a distance of 10 mm from the clamp, the test results shall be discarded and a retest shall be carried out on a new specimen.

ANNEX C
(Clause 6.5)

METHOD OF DETERMINING WATER CONTENTS

C-1 A portion of insulation mill board weighing approximately 10 g taken from two parts of each sheet (*see 6*) shall be placed in a previously weighed glass dish with glass cover and weighed to the nearest 0.01 g, dried in a thermostatically controlled air oven at a temperature of 105 °C to 110 °C for 2 h, then cooled in a desiccator for one hour minimum and weighed with the same precision. Drying and weighing of the glass dish with weighed portion of the sheet shall be repeated until the results of two successive weighing does not differ by more than 0.01g.

C-2 Water contents percentage shall be calculated as:

$$\text{Water contents in percentage} = \frac{W_1 - W_2}{W_1 - W_g} \times 100$$

where

W_1 = Weight of glass dish with specimen in g before drying;

W_2 = Weight of glass dish with specimen in g after drying; and

W_g = Weight of glass dish in g.

C-3 The arithmetic means of three test results shall be taken as the water contents of insulation mill board of the given lot.

ANNEX D
(Clause 6.6)

METHOD OF DETERMINING LOSS ON IGNITION

D-1 A portion of the dried sheet weighing approximately 10 g taken after determination of water contents (*see 6.5*), shall be placed in a previously weighed crucible, weighed to the nearest 0.01 g and ignited in a muffle furnace at a temperature of $800 \pm 20^\circ\text{C}$ for one hour.

D-2 Ignition and weighing of the crucible with the weighed test piece shall be repeated until the results of two successive weighing does not differ by more than 0.01 g.

D-3 Loss on ignition in percent shall be calculated as:

$$\text{Loss on ignition, in percentage} = \frac{W_3 - W_4}{W_3 - W_c} \times 100$$

where

W_3 = Weight of crucible and test piece in g before ignition;

W_4 = Weight of crucible and test piece in g after ignition; and

W_c = Weight of crucible in g.

D-4 The arithmetic means of these test results shall be taken as loss on ignition of insulation mill board of the given lot.

ANNEX E
(Clause 6.7)

METHOD OF DETERMINING pH OF WATER EXTRACT

E-1 A portion of the insulation mill board weighing 15g taken from two parts of each sheet shall be placed in a 500 ml conical flask, then 300 ml of distilled water with a pH ranging from 6.6 to

7.1 shall be poured into the flask. The contents of the flask shall be vigorously shaken, allowed to stand and shaken again after 30 min and then filtered through a clean glass porous filter.

E-2 The first portion of the filtrate (20 to 30 ml) shall be discarded, then 100 to 200 ml filtrate (of the water extract) shall be collected and its *pH* is determined by quinhydrone method, using a *pH* meter.

ANNEX F
(*Clause 6.8*)

METHOD OF DETERMINING CHLORIDE AND SULPHATE CONTENTS

F-1 The presence of Cl and SO₄ in the water extract shall be determined in the filtrate remaining unused after the determination of *pH* (*see 6.7*). The water extract shall be poured into two clean glass test tubes. Several drops of concentrate nitric acid and then several drops of a one percent solution of silver nitrate shall be added to one of the test tubes. If after the addition of the reagents, the water extract in the test tube remains transparent (no formation of suspended matter is observed) this indicates that the water extract is free from Cl.

F-2 Several drops of concentrated hydrochloric acid and then several drops of a heated 10 percent solution of barium chloride shall be added to the other test tube. After that, water extract shall be heated to boiling. If after the addition of the reagents the water extract in the test tube remains transparent (no formation of suspended matter is observed), this indicates that the water extract is free from SO₄.