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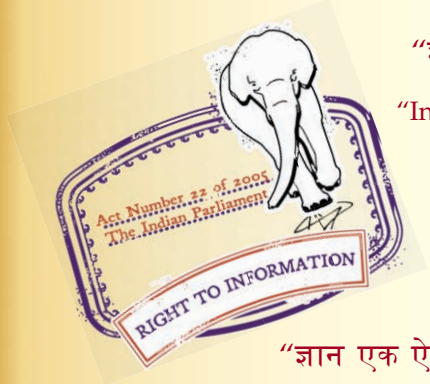
IS 8183 (1993): Bonded mineral wool [CHD 27: Thermal Insulation]



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"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

(Reaffirmed 2004)

आबंधित खनिज ऊन – विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

BONDED MINERAL WOOL — SPECIFICATION

(First Revision)

UDC 666·198 : 662·998

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 1993

Price Group 3

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Thermal Insulation Materials Sectional Committee had been approved by the Chemical Division Council.

Bonded mineral wool can be used with a suitable facing material for a temperature range of −40°C to 700°C. Use at lower temperatures has not been covered in this standard as the methods of test for testing mineral wool products at lower temperatures have not been fully established yet. Possibility of use at lower temperature is being examined alongwith the application techniques which are equally important.

This standard was originally printed in 1976. In this first revision of the standard, the groupings on the basis of bulk density have been changed and the requirements of incombustibility and heat resistance have been modified. The sampling of bonded mineral wool has also been modified.

The committee responsible for the formulation of this standard is given in Annex D.

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 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BONDED MINERAL WOOL — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for bonded mineral wool for thermal insulation.

2 REFERENCES

The Indian Standards listed below are the necessary adjuncts to this standard:

IS No.	*Title*
1070 : 1992	Reagent grade water (*third revision*)
3069 : 1965	Glossary of terms, symbols and units relating to thermal insulation materials
314 : 1990	Methods of test for mineral wool thermal insulation (*first revision*)
3346 : 1980	Methods for the determination of thermal conductivity of thermal insulation materials (two slab, guarded hot-plate method) (*first revision*)

3 TERMINOLOGY

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

4 REQUIREMENTS

4.1 Description

The material shall be mineral wool made from rock, slag or glass processed from a molten state into fibrous form and shall be bonded with a suitable binder.

4.1.1 The slabs are normally supplied unfaced. Certain applications may require an applied finish of cloth, foil, wire netting, glass tissue, polythene or any other suitable material on one or both faces and these may be obtained as agreed to between the purchaser and the supplier.

4.2 Bulk Density

The bulk density of the material, excluding facing, shall be within the following ranges and may be suitable for use up to a particular hot-face temperature given below:

Group	*Bulk Density* kg/m³	*Maximum Recommended Hot Face Temperature* °C
1	12-50	Up to 250
2	51-80	Up to 400
3	81-120	Up to 550
4	121-160	Up to 750

4.2.1 For any particular product, the variation from the manufacturer's declared value for bulk density shall not exceed ±15 percent when tested in accordance with the method prescribed in 9 of IS 3144 : 1990 except that nominal/ specified thickness shall be used for calculating the bulk density.

NOTE — Materials in each group are made in a range of bulk densities and thermal conductivities; the required mechanical properties and other aspects should be considered when selecting the most suitable density.

4.3 Recovery After Compression

When tested in accordance with the method prescribed in Annex A, the recovery, after compression of 75 percent of the original thickness, shall not be less than 90 percent of the original thickness.

4.4 Shot Content

The shot content, when sieved through the prescribed sieve, shall not be more than the values given below. The method for the determination of shot content shall be as prescribed in **13** of IS 3144 : 1990. Any shot present in the bonded mineral wool shall not be greater than 5 mm in any dimension:

IS Sieve	*Shot Content, Percent by Mass, Max*
500 micron	5
250 micron	15

4.5 Moisture Content and Moisture Absorption

The material, as received, shall not contain more than 2 percent moisture when determined by the method prescribed in **14** of IS 3144 : 1990. It shall not gain in mass by more than 2 percent when tested by the method prescribed in **15** of IS 3144 : 1990.

4.6 Incombustibility

The material shall be rated as incombustible when it passes the test as prescribed in **16** of IS 3144 : 1990.

4.6.1 The loss in total mass when determined by this test shall not exceed 5 percent.

NOTE — In some cases, as agreed to between the purchaser and the manufacturer, the loss may be higher especially when the resin content is higher.

4.7 Thermal Conductivity

The thermal conductivity or k-value of the material shall not exceed the values given below when determined in accordance with the method prescribed in **11** of IS 3346 : 1980.

Mean Temperature	*Thermal Conductivity* mW/cm °C			
°C	Group 1	Group 2	Group 3	Group 4
50	0·49	0·43	0·43	0·43
100	0·69	0·52	0·52	0·52
150	0·95	0·64	0·62	0·62
200	—	0·78	0·73	0·68
250	—	0·93	0·84	0·80
300	—	1·10	0·95	0·90

4.8 Sulphur Content

The material, after removal of the facing, if any, shall not contain more than 0·6 percent of sulphur when determined by the method prescribed in **19** of IS 3144 : 1990.

4.9 Dimensions

The bonded mineral wool shall be supplied in widths of 50, 60, 75 and 100 cm and lengths of 100, 120 and 140 cm or as agreed to between the purchaser and the supplier. The method of determination of these dimensions shall be as prescribed in **6** of IS 3144 : 1990. The thickness of the bonded mineral wool shall be 25, 40, 50, 65, 75 mm or as agreed to between the purchaser and the supplier. The method of determining the thickness shall be as prescribed in 7 of 3144 : 1990.

4.9.1 *Dimensional Tolerances*

For width and length, the dimensional tolerance of the bonded mineral wool slabs shall be $-1/2$ percent. For nominal thickness in the range of 25 to 75 mm the tolerance shall be -2 mm. An excess in all dimensions is permitted. However, the upper tolerance and the tolerance for nominal thickness outside this range, shall be as agreed to between the purchaser and the manufacturer.

4.10 Optional Requirements

If required by the purchaser, the bonded mineral wool shall also comply with the optional requirements given in **4.10.1** to **4.10.7.**

4.10.1 *Resistance to Micro-organisms*

The bonded mineral wool shall not show any mould or bacterial growth when tested by the method prescribed in **17** of IS 3144 : 1990.

4.10.2 *Odour Emission Test*

There shall be no apparent difference in odour of the butter when compared with the blanks when tested by the method prescribed in **18** of IS 3144 : 1990.

4.10.3 *Resistance to Vibration*

The bonded mineral wool shall show not more than 1 percent height of settlement when tested by the method prescribed in **22.2** of IS 3144 : 1990.

4.10.4 *Resistance to Jolting*

The bonded mineral wool shall show not more than 3 percent height of settlement, or as agreed to between the purchaser and the supplier, when tested by the method prescribed in **22.3** of IS 3144 : 1990.

4.10.5 *Heat Resistance*

The material shall not suffer any visible deterioration of the fibrous structure and shall not show any evidence of internal self-heating when heated to the maximum recommended temperature of use, as specified by the manufacturer when tested according to the method prescribed in **12** of IS 3144 : 1990.

NOTE — Any colour change shall not be considered as visible deterioration in fibrous structure.

4.10.6 *Alkalinity*

The *p*H of the solution of the material shall be between 7·0 and 10·0 when tested in accordance with the method prescribed in Annex B.

4.10.7 *Corrosive Attack*

The material shall not cause corrosion of the surface on which it is applied.

NOTE — Bonded mineral wool may possibly contain up to approximately 0·01 percent of chloride. If circumstances can arise in practice such that chloride concentration can take place on the surface of certain alloy steels, for example austenitic steels, then there is a serious risk of stress corrosion cracking and suitable design safeguards should be adopted.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed in polythene-lined hessian bags or polythene bags or as agreed to between the purchaser and the supplier.

5.2 Marking

The packages shall be legibly and indelibly marked with with the following information:

a) Indication of the source of manufacture;

b) Apparent density of the materials;

c) Length, thickness and width of the material;

d) Details of confining media, if any; and

e) Batch number.

6 SAMPLING

6.1 Representative samples of the material shall be drawn and their conformity determined in accordance with the method prescribed in Annex C.

ANNEX A

(*Clause* 4.3)

DETERMINATION OF RECOVERY AFTER COMPRESSION

A-1 SAMPLE

A-1.1 Use a sample with an edge length of at least 100 mm or not less than twice the thickness of the sample, whichever is greater The sample is tested at the thickness as supplied or at a multiple thereof (by piling two or more pieces).

A-2 PROCEDURE

A-2.1 Measure the thickness of the test-sample, T_1, as prescribed in IS 3144 : 1990. Apply a load evenly distributed over the surface, sufficient to reduce the thicknes to 75 percent of the original. Leave under load for 5 minutes.

A-2.2 Remove the load and allow the sample to recover for 5 minutes. Measure the final thickness, T_2, as prescribed in IS 3144 : 1990.

A-3 CALCULATION

A-3.1 Percentage of original thickness:

$$= \frac{T_2}{T_1} \times 100$$

where

T_1 = the original thickness, mm; and

T_2 = the thickness after compression, mm.

ANNEX B

(*Clause* 4.10.6)

TEST FOR ALKALINITY

B-1 APPARATUS

B-1.1 ***p*H Meter** — Use a standard laboratory *p*H meter.

B-2 PROCEDURE

B-2.1 From the bulk sample, draw approximately 5 g of bonded mineral wool. Then weigh 2 g, shake well for 10 minutes with 100 ml of distilled water (*see* IS 1070 : 1992) at room temperature. Allow 5 minutes time and then measure the *p*H of the mixture, using a standard *p*H meter. Repeat the test on a further 2 g sample and record the mean *p*H value.

ANNEX C

(*Clause* 6.1)

SAMPLING OF BONDED MINERAL WOOL

C-1 SAMPLING

C-1.1 Lot

All the material of the same density produced under essentially the same conditions of manufacture shall be grouped and each such group shall constitute a separate lot.

NOTE — The purchaser and the supplier may mutually agree to term the material manufactured during a certain period as a lot. It is recommended that an 8-hour production under essentially same conditions may be termed as a lot.

C-2 DETERMINATION OF SAMPLE SIZE

C-2.1 Tests for the conformity to the requirements of the specification shall be done on each lot separately. The material to be selected from a lot shall be in accordance with Table 1.

C-2.2 These slabs shall be selected at random from the lot and to ensure randomness of selection, random number tables shall be used. In case such a table is not available, the following procedure may be adopted:

Starting from any slab in the lot, count them as 1, 2, 3, ..., up to r and so on, where r is the integral part of N/n (N being the lot size and n being the number of slabs to be selected). Every rth slab thus counted shall be withdrawn from the lot to give samples for tests.

C-3 NUMBER OF TESTS

C-3.1 From each of the slabs selected according to **C-2.2**, test specimens necessary for carrying out the various tests specified in this standard shall be taken, care being exercised to exclude some amount of wool from the top of the slab.

C-3.2 Tests for the determination of all characteristics specified in this standard shall be conducted on each of the test specimens drawn from the slab as obtained under **C-3.1.**

C-3.3 Criteria for Conformity

The lot shall be declared as conforming to the requirements of this specification if the different test results obtained under **C-3.2** meet the corresponding requirements given in the standard individually.

Table 1 Number of Slabs to be Selected for Sampling

(*Clause* C-2.1)

Clause No. of IS 8183 : 1991	Lot Size (N)					
	Up to 200	201 to 300	301 to 500	501 to 800	801 to 1300	1300 & above
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	No. of Slabs to be Selected (n)					
3.2	5	6	7	8	9	10
3.3	←	One for each density for all lot size				→
3.4		do				
3.5		do				
3.6		do				
3.7		do				
3.8		do				
3.9	5	6	7	8	9	10
3.10.1	←	One for each density for all lot size				→
3.10.2		do				
3.10.3		do				
3.10.4		do				
3.10.5		do				
3.10.6		do				

ANNEX D

(Foreword)

COMMITTEE COMPOSITION

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indin Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'. Comments on this Indian Standard may be sent to BIS giving the following reference:

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Amendments Issued Since Publication

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AMENDMENT NO. 1 JULY 1997
TO
IS 8183 : 1993 BONDED MINERAL WOOL — SPECIFICATION

(First Revision)

(*Page* 4, *Annex* C, *Table* 1) — Substitute the following for the existing table:

'Table 1 Number of Slabs to be Selected for Sampling
(*Clause* C-2.1)

Clause No. of IS 8183 : 1993	Lot Size (*N*)					
	Up to 200	201 to 300	301 to 500	501 to 800	801 to 1 300	1 300 & above
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			No. of Slabs to be Selected (n)			
4.2	5	6	7	8	9	10
4.3	←		One for each density for all lot size			→
4.4			do			
4.5			do			
4.6			do			
4.7			do			
4.8			do			
4.9	5	6	7	8	9	10'
4.10.1	←		One for each density for all lot size			→
4.10.2			do			
4.10.3			do			
4.10.4			do			
4.10.5			do			
4.10.6			do			
4.10.7			do			

(CHD 027)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 2 AUGUST 2003
TO
IS 8183 : 1993 BONDED MINERAL WOOL — SPECIFICATION

(First Revision)

(*Second cover page, Foreword, para* 2, *line* 2) — Substitute '750°C' *for* '700°C'.

(*Page* 1, *clause* **2**) — Substitute the following for the existing matter:

'2 REFERENCES

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1070 : 1992	Reagent grade water (*third revision*)
3069 : 1994	Glossary of terms, symbols and units relating to thermal insulation materials (*first revision*)
3144 : 1992	Mineral wool thermal insulation materials — Methods of test (*second revision*)
3346 : 1980	Method of determination of thermal conductivity of thermal insulation materials (two slab guarded hot-plate method) (*first revision*)'

(*Page* 1, *clause* **3**) — Substitute 'IS 3069' *for* 'IS 3069 : 1965'.

(*Page* 1, *clauses* **4.2.1**, **4.4** *and* **4.5**) — Substitute 'IS 3144' *for* 'IS 3144 : 1992'.

(*Page* 2, *clause* **4.7**) — Substitute 'IS 3346' *for* 'IS 3346 : 1980'.

(*Page* 2, *clauses* **4.8**, **4.9**, **4.10.1** *to* **4.10.5**) — Substitute 'IS 3144' *for* 'IS 3144 : 1992'.

(*Page* 3, *clauses* **A-2.1** *and* **A-2.2**) — Substitute 'IS 3144' *for* 'IS 3144 : 1992'.

(CHD 27)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 3 MARCH 2007
TO
IS 8183:1993 BONDED MINERAL WOOL — SPECIFICATION

(First Revision)

(*Page* 1, *clause* **4.1.1**, *line* 1) — Substitute 'slabs/mattresses/blankets/ bands/rolls' *for* the word 'slabs'.

(*Page* 1, *clause* **4.3**, *line* 3) — Substitute the words 'compression to 75 percent' *for* 'compression of 75 percent'.

(*Page* 2, *clause* **4.9.1**) — Insert the following new clause after **4.9.1** and renumber the subsequent clauses:

'**4.10 Fibre Diameter** — The fibre diameter when tested as per clause **24** of IS 3144 shall be 7 μ, *Max*.'

(CHD 27)

Reprography Unit, BIS, New Delhi, India