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IS 9842 (1994): Preformed fibrous pipe insulation [CHD 27: Thermal Insulation]



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पूर्वबलित रेशेदार पाइप विद्युतरोधन – विशिष्ट
(पहला पुनरीक्षण)

Indian Standard

**PREFORMED FIBROUS PIPE INSULATION —
SPECIFICATION**

(First Revision)

UDC 662-998-462 : 666-198

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

FOREWORD

This Indian Standard (First Revision) 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.

Preformed fibrous pipe insulation can be used with a suitable finish and vapour barrier to avoid ingress of moisture, for a temperature range of -40 to 700°C . Use at lower temperatures has not been covered in this standard as the methods for testing preformed fibrous pipe insulation at lower temperatures have not been fully established yet. Possibility of use at lower temperatures is being examined along with the application techniques which are equally important.

This standard was first published in 1981. Based on experience gained during the last decade the requirements of dimensions and heat resistance test have been modified and sampling procedure has also been modified in this revision.

The composition of technical committee responsible for preparation 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

PREFORMED FIBROUS PIPE INSULATION — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for preformed fibrous pipe sections 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 (<i>third revision</i>)
3069 : 1965	Glossary of terms, symbols and units relating to thermal insulation materials
3144 : 1990	Methods of test for mineral wool thermal insulation materials (<i>first revision</i>)
3346 : 1980	Methods for the determination of thermal conductivity of thermal insulation materials (two slab, guarded hot-plate method) (<i>first revision</i>)
4905 : 1968	Methods for random sampling
5688 : 1970	Methods of test for preformed block-type and pipe-covering type thermal insulation (<i>first revision</i>)
5724 : 1970	Methods of test for thermal insulating cements

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 bonded with a suitable binder.

4.1.1 The sections shall normally be supplied unfaced. Certain applications may require an applied finish of aluminium foil, paper, roofing felt or other material. 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, will normally be within the following ranges and may be suitable for use up to a particular hot face temperature given below:

Group	Bulk Density, kg/m ³	Maximum Recommended Hot Face Tempe- rature, °C
1	50-80	Up to 400
2	81-120	Up to 550
3	121-160	Up to 650
4	161-250	Up to 750

4.2.1 For any particular product, the variation from the manufacturer's declared value for bulk density, calculated at the nominal thickness, shall not exceed ± 15 percent, when tested in accordance with the method prescribed in 4 of IS 5688 : 1970. The actual bulk density shall, however, be within the bulk density range given in 4.2.

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

4.3 Shot Content

The shot content, when sieved through the prescribed sieve, shall be not more than the values given below. The method for the determination of shot content shall be as prescribed in 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

4.4 Moisture Content and Moisture Absorption

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

4.5 Incombustibility

When tested in accordance with the method prescribed in IS 3144 : 1990, the material shall be found to be incombustible.

4.5.1 The loss in total mass, when tested for incombustibility, 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.

4.6 Thermal Conductivity

The thermal conductivity of the material shall not exceed the values given below, when determined in accordance with the method prescribed in IS 3346 : 1980.

Mean Temperature °C	Thermal Conductivity mW/cm°C			
	Group 1	Group 2	Group 3	Group 4
50	0.43	0.43	0.43	0.43
100	0.52	0.52	0.52	0.52
150	0.64	0.62	0.62	0.62
200	0.78	0.73	0.70	0.68
250	0.93	0.85	0.85	0.80
300	1.10	1.00	1.00	0.90

NOTE — To meet the requirements of this table, products of different bulk density may be supplied for use at different service temperatures. The service temperature should be stated by the purchaser. For thermal conductivity determinations, in the absence of special apparatus for determination of thermal conductivity of pipe section, a flat slab of the same bulk density and fibrous structure as the material may be used for test.

4.7 Dimensions

The mineral fibre pipe insulation shall be supplied as hollow cylinders split lengthwise on one or both sides of the cylindrical axis, with lengths of 50 cm, 60 cm, 75 cm, 90 cm and 100 cm to fit standard sizes of pipe and tubing. The nominal thicknesses regularly furnished shall be 25 mm, 40 mm, 50 mm, 60 mm, 75 mm, 90 mm and 100 mm. Nominal thicknesses greater than 60 mm may be furnished in multiple layers. Individual dimensions shall conform to those agreed to between the purchaser and the supplier, as these would depend on the diameter of pipe or tubing to the insulated and the nominal thickness required.

4.7.1 Dimensional Tolerance

For length, the tolerance shall be -0.5 percent; excess is permitted. For nominal thickness up to 75 mm the tolerance shall be $+5$ mm, -2 mm. For greater nominal thicknesses, the tolerance on thickness shall be as agreed to between the purchaser and the supplier. When installed on the pipe of the specified size, sections shall fit snugly and shall have tight longitudinal and circumferential joints.

4.8 Linear Shrinkage

When tested in accordance with the method prescribed in IS 5724 : 1970, linear shrinkage of the material shall be not greater than 2 percent when subjected to conditions of soaking heat at the stated maximum temperature of use for 24 hours.

4.9 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 IS 3144 : 1990.

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

4.9.1 In the absence of special apparatus for determination of thermal conductivity of pipe section, a flat slab of the same bulk density and fibrous structure as the material may be used for the test.

4.10 Recovery After Compression

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

4.11 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 IS 3144 : 1990.

4.12 Optional Requirements

If required by the purchaser, the material shall also comply with the optional requirements given in 4.12.1 to 4.12.4.

4.12.1 Alkalinity

The pH of the solution of the material shall be between 7.0 and 10.0, when tested by the method prescribed in Annex B.

4.12.2 Resistance to Micro-organisms

The material shall not show any mould or bacterial growth, when tested by the method prescribed in IS 3144 : 1990.

4.12.3 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 IS 3144 : 1990.

4.12.4 Corrosive Attack

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

NOTE — The material may possibly contain up to approximately 0.01 percent of chloride. If circumstances arise in practice where chloride concentration takes 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 The mineral fibre preformed pipe insulation shall be packed in the manufacturer's standard commercial containers or as agreed to between the purchaser and the supplier.

5.2 Marking

The packages shall be legibly and indelibly

marked with the following information:

- a) Indication of the source of manufacture;
- b) Name of the material;
- c) The pipe size for which it is suitable;
- d) The nominal thickness;
- e) The quantity of material in the container;
- f) Bulk density of the material;
- g) Maximum temperature of use; and
- h) Batch number.

5.3 BIS Certification Marking

The product may also be marked with Standard Mark.

5.3.1 The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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 4.10)

DETERMINATION OF RECOVERY AFTER COMPRESSION**A-1 SAMPLE**

A-1.1 Use a test specimen with a 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 except that a mandrel or pipe of the appropriate size shall be used instead of the glass/mild steel sheet. Apply a load evenly distributed over the surface, sufficient to reduce the thickness 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 A-2.1.

A-2.3 In the absence of special apparatus for determination of thermal conductivity of pipe section, a flat slab of the same bulk density and fibrous structure as the material may be used for the test.

A-3 CALCULATION

A-3.1 Percentage of original thickness:

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

where

T_1 = original thickness, mm, and

T_2 = thickness after compression; mm.

ANNEX B

(Clause 4.12.1)

TEST FOR ALKALINITY

B-1 APPARATUS

B-1.1 pH Meter — Use a standard laboratory pH meter.

B-2 PROCEDURE

B-2.1 From the bulk sample, draw approximately 5 g of the material. 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 pH of the mixture, using a standard pH meter. Repeat the test on a further 2g sample and record the mean pH value.

ANNEX C

(Clause 6.1)

SAMPLING OF PREFORMED FIBROUS PIPE INSULTATION

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 be in accordance with Table 1.

C-2.2 These sections shall be selected at random from the lot and to ensure randomness of selection, random number tables (*see* IS 4905 : 1968) 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 r th slab thus counted shall be withdrawn from the lot to give sample 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 Sections to be Selected for Sampling
(Clause C-2.1)

Clause No. of IS 9842 : 1993	Lot Size (N)					
	Up to 200	201 to 300	301 to 500	501 to 800	801 to 1 300	1 301 & above
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>No. of sections to be Selected (n)</i>					
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	← One for each density for all lot size →					
4.11			do			
4.12.1			do			
4.12.2			do			
4.12.3			do			
4.12.4			do			

ANNEX D

(Foreword)

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AMENDMENT NO. 1 MAY 2002
TO
IS 9842 : 1994 PREFORMED FIBROUS PIPE INSULATION
— SPECIFICATION

(First Revision)

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

(Page 2, clause 4.8) — Insert the following at the end:

'NOTE – To avoid crushing the ends of the specimen, travelling microscope should be used.

(Page 5, Table 1, col heading 1) — Substitute 'IS 9842 : 1994' for 'IS 9842 : 1993'

(CHD 27)

**AMENDMENT.NO. 2 FEBRUARY 2007
TO
IS 9842 : 1994 PREFORMED FIBROUS PIPE
INSULATION — SPECIFICATION**

(*First Revision*)

(Page 2, clause 4.11) — Insert the following new clause after **4.11** and renumber the subsequent clauses:

‘4.12 Fibre Diameter — The fibre diameter when tested in accordance with the method prescribed in clause 24 of IS 3144 shall be $7\ \mu$, *Max.*’

(CHD 27)