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(पहला पुनरीक्षण)

Indian Standard

THERMAL INSULATION FINISHING CEMENT — SPECIFICATION

(First Revision)

UDC 666·96

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

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Price Group 2

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 20 February 1990, after the draft finalized by the Thermal Insulation Materials Sectional Committee had been approved by the Chemical Division Council.

Finishing cements are used in conjunction with thermal insulating materials and should, therefore, be compatible with them. These materials are used as finishing cements, both for hot and cold insulation work. For low temperature, a vapour barrier has to be used and for outdoor jobs suitable water proofing should be done.

Finishing cements are generally supplied as dry powders, which are mixed with water in suitable proportions, applied in plastic form, and dried or set in place to form a hard and smooth surface (*see* **6.3.1**).

The materials are of four types (*see* **4.1**). Hard-setting and gypsum plaster compositions are suitable for indoor applications, while self-setting cements are suitable for outdoor applications. This standard does not prescribe requirements for setting time.

Hard setting compositions do not contain hydraulic setting agents and setting time depends upon the rate at which the mixing water is either absorbed into the underlying insulation or evaporated from the surface, or both. Hard-setting compositions reasonably set in 5 to 6 hours, although complete drying may take much longer.

Self-setting cements are hydraulic setting and only such quantity as can be used within 1 hour should be mixed at one time. The time for the cement to take an initial set depends upon the absorbancy of the underlying insulating material. On absorbent material the cement takes its initial set and can be compacted and finally trowelled in 2 to 3 hours. On non-absorbent or only slightly absorbent material the initial set may take up to 12 hours. Final drying out of these cements depends on the ambient temperature.

Gypsum plaster compositions set much more rapidly and only as much as can be used within 30 minutes should be mixed at one time. These compositions generally set hard over absorbent or non-absorbent insulation materials within 1 hour.

This standard was first published in 1981. Based on the experience gained during the period, it has been decided to revise this standard incorporating the following changes:

a) Inclusion of another type of finishing cement, namely, fire-proof finishing cements;

b) Stipulation of mixing proportions;

c) Deletion of flexural strength for Types 2 and 3;

d) Reduction of soaking heat temperature from 150°C to 100°C; and

e) Aligning of Table 1 and Clause B-2.1.

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

THERMAL INSULATION FINISHING CEMENT — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard prescribes the requirements for thermal insulation finishing cements, prepared by mixing with water for application to insulating materials after they have been applied at site to the plant or piping systems.

NOTE — Some of these finishing cements are used for services at temperatures below ambient, in which case a vapour barrier is required.

1.2 This standard does not prescribe requirements for setting time.

2 REFERENCES

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

IS No.	*Title*
3069 : 1965	Glossary of terms, symbols and units relating to thermal insulation materials
3144 : 1981	Methods of test for mineral wool thermal insulation materials (*first revision*)
4905 : 1968	Methods for random sampling
5688 : 1982	Methods of test for performed block-type and pipe covering type thermal insulation (*first revision*)
5724 : 1970	Methods of test for thermal insulating cements.

3 TERMINOLOGY

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

4 TYPES

4.1 Thermal insulation finishing cements shall be of four types:

Type 1 — Hard-setting compositions (*see* **4.1.1**),

Type 2 — Self-setting cements (*see* **4.1.2**),

Type 3 — Gypsum plaster compositions (*see* **4.1.3**), and

Type 4 — Fire-proof finishing cements (*see* **4.1.4**).

4.1.1 Type 1 finishing cements are a mixture of inorganic fillers and well distributed reinforcing fibres with a clay bonding agent, and set by removal of water by natural drying or on heating. The normal ratio of hard-setting cements will be 1 part of hydraulic cement to 4 parts of hard-setting composition.

4.1.2 Type 2 finishing cements consist of well distributed reinforcing fibres (1 part) with a hydraulic cement (3 parts) as binder, with or without plasticizing agents or fillers. These set without the application of heat.

4.1.3 Type 3 finishing cements set without the application of heat and consist of calcium sulphate hemihydrate, and well distributed reinforcing fibres, usually to a lower percentage by mass than for self-setting cement.

4.1.4 Type 4 fire-proof cement is non-combustible and could effectively be used as a finishing cement over turbine insulation applications, etc. where the finishing cement should not give rise to fire due to oil leakage, etc.

NOTE — Thermal insulation finishing cements of Type 1 and Type 3 are not suitable for exposure to weather conditions without further protection.

5 REQUIREMENTS

5.1 Description

The finishing cements shall be thoroughly premixed and free from unopened or badly distributed fibres or coarse constituents.

5.2 Bulk Density

The average bulk density of the four types of the finishing cements, applied and dried, shall be as given below when tested in accordance with the method prescribed in **4** of IS 5688 : 1982 after preparing a block of material as prescribed by the manufacturer:

Type of the Finishing Cement	*Density* kg/m³, *Max*
1	1 500
2	1 800
3	1 600
4	1 300

5.3 Wet Covering Capacity

Wet covering capacity of the four types of finishing cements shall be not less than 6 m²/100 kg at 10 mm thickness, when tested in accordance with the method prescribed in **6** of IS 5724 : 1970.

NOTE — The wet covering capacity over insulation may differ from the result obtained by this method, which refers to a non-absorbent substrate. The wet covering capacity of Type 1 cements cannot be directly related to the dry density as some of the materials used for mixing combine chemically with hydraulic cement. The water of hydration in this type of cements varies from material to material.

5.4 Inertness

The finishing cement shall not include any substance that may promote corrosive attack of the surfaces with which it is in contact, for example, wire netting used as reinforcement.

5.5 Compressive Strength

The compressive strength of the finishing cement at 10 percent deformation shall be as given below, when tested in accordance with the method prescribed in 7 of IS 5724 : 1970 except that the sample size shall be 75 × 75 × 25 mm. The density of the specimen tested shall be stated.

Type of the Material	*Compressive Strength* kN/m³, *Min*
1	1 030
2	1 720
3	8 20
4	1 800

5.6 Flexural Strength

The flexural strength of the finishing cement of Type 1 shall be not less than 2 000 kN/m².

5.7 Resistance to Impact

For finishing cement of Type 2, when tested in accordance with the method prescribed in Annex A, the average diameter of five indentations shall not exceed 30 mm. Any cracking of the specimen that is observed shall be reported.

5.8 Heat Resistance

When subjected to soaking heat at 100°C for 24 hours, in accordance with 9 of IS 5724 : 1970, the blocks of the, finishing cement shall neither disintegrate, nor have observable cracks.

5.9 Consistency of Wet Mixed Material

The consistency of the wet material, when prepared in accordance with the manufacturer's recommendations for application, shall be 35 to 45 percent when tested in accordance with the method prescribed in 5.1 of IS 5724 : 1970.

5.10 Moisture Content

For hard setting compositions, the maximum free moisture content shall be not greater than 5 percent, and self-setting compositions and gypsum plaster shall be supplied dry when tested in accordance with the method prescribed in 13 of IS 3144 : 1981 except that three specimens shall be taken from the composite sample, each weighing not less than 100 g, and spread well on trays to expose the material while placing in the oven.

6 PACKING, STORAGE AND MARKING

6.1 Packing

The material shall be packed in 12·5, 25 or 50 kg multiwall bags incorporating a waterproof membrane or as agreed to between the purchaser and the supplier.

6.2 Storage

The material shall be stored in a dry place.

6.3 Marking

Each package shall be legibly and indelibly marked with the following information:

a) Identification of the source of manufacture;

b) Batch number or year of manufacture;

c) Net mass of the contents; and

d) Type of materials.

6.3.1 Information regarding conditions and time for setting, and instructions pertaining to application and curing should be furnished along with the supply, preferably by means of a tag on each package. It should also be indicated whether the material contains asbestos.

7 SAMPLING

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

ANNEX A

(*Clause* 5.7)

RESISTANCE TO IMPACT TEST FOR TYPE 2 CEMENT

A-1 PROCEDURE

Cut specimens from samples moulded in accordance with the method specified for the determination of wet covering capacity. The size of specimen shall be about 250 × 250 × 25 mm. Place the specimen on a flat, smooth concrete floor or steel plate. Drop a steel ball of mass 1 kg and 62·5 mm diameter from a height of 1·5 on the surface of the specimen, at least 50 mm from the nearest edge and from the location of a previous indentation, Measure the diameter of the impression made by the ball. Repeat the test for at least five indentations. Report any cracking of the specimen that is observed.

ANNEX B

(*Clause* 7.1)

SAMPLING OF THERMAL INSULATION FINISHING CEMENT

B-1 SCALE OF SAMPLING

B-1.1 Lot

The bags of finishing cement belonging to the same batch of manufacture, in a single consignment, shall be grouped together and each such group shall constitute a lot.

B-1.2 For ascertaining the conformity of the lot to the requirements of this specification, test shall be carried out on each lot separately.

B-1.3 The number of bags to be selected (n) shall depend on the lot size (N) and shall be in accordance with Table 1.

Table 1 Number of Bags to be Selected for Sampling

(*Clause* 7.1)

Lot Size (N)	No. of Bags to be Selected (n)
(1)	(2)
Up to 25	1
26 to 50	2
51 to 100	3
101 and above	4

B-1.3.1 These bags shall be selected at random. In order to ensure the randomness of selection, random sampling procedure given in IS 4905 : 1968 shall apply.

B-2 PREPARATION OF TEST SAMPLE AND NUMBER OF TESTS

B-2.1 From each of the bags selected according to **B-1.3**, approximately equal quantity of the material shall be taken and thoroughly mixed to form a composite sample weighing not less than 45 kg which would be sufficient for carrying out triplicate determination of all characteristics given in **5**.

B-2.1.1 The composite sample shall be divided into three equal parts, one for the purchaser, another for the supplier and the third to be used as a referee sample.

B-2.1.2 These three parts of the composite sample shall be transferred to separate sample bags. These bags shall be properly stitched and labelled with full identification particulars.

B-2.2 Tests for determination of all characteristics given in **5** shall be conducted on the composite sample.

B-3 CRITERIA FOR CONFORMITY

B-3.1 The lot shall be declared as conforming to the requirements of this specification if all the test results on the composite sample satisfy the corresponding requirements given under **5**.

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