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IS 11128 (1984): Spray applied hydrated calcium silicate thermal insulation [CHD 27: Thermal Insulation]

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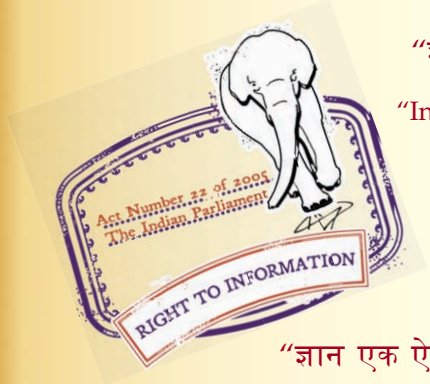

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"Knowledge is such a treasure which cannot be stolen"

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IS : 11128 - 1984

(Reaffirmed 2004)

Indian Standard

SPECIFICATION FOR SPRAY-APPLIED HYDRATED CALCIUM SILICATE THERMAL INSULATION

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INDIAN STANDARDS INSTITUTION
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NEW DELHI 110002

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March 1985

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SPECIFICATION FOR SPRAY-APPLIED HYDRATED CALCIUM SILICATE THERMAL INSULATION

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Indian Standard

SPECIFICATION FOR SPRAY-APPLIED HYDRATED CALCIUM SILICATE THERMAL INSULATION

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 October, 1984 after the draft finalized by the Thermal Insulation Materials Sectional Committee had been approved by the Chemical Division Council.

0.2 The spray-applied, hydrated calcium silicate insulation consists of inorganic hydrated calcium; mineral fibre and additives. The binder and calcium silicate should be uniformly blended and should not separate during normal handling and spraying operation.

0.3 Inorganic hydrated calcium silicate sprayable insulation is sprayed on a cleaned surface through a spray gun with controlled amounts of water to promote adhesion and after drying, for use as thermal insulation on surfaces operating at temperatures up to 800°C. The mixture strikes the surface and adheres to it forming a monolithic seamless shape. The type of spray apparatus and method of application shall be specified by the manufacturer and the sprayed insulation shall be finished to the thickness specified by the purchaser. The thickness shall not vary from the nominal value at prominent surfaces by more than + 6 mm.

— 3

0.4 Spraying the insulation material is a modern technique adopted for insulation of large vessels and systems, fire protection of structurals, etc. This method provides uniform covering on all parts of large vessels.

0.5 The sprayed hydrated calcium silicate insulation, while still moist, may or may not be consolidated (subject to agreement between supplier and contractor) with a suitable trowel of board, to a level surface free of visible defects that could adversely affect the service quality.

0.6 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*. The number of significant places retained in the rounded off value should be the same as that of the specified values in this standard.

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

1. SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for spray-applied, hydrated calcium silicate thermal insulation.

2. TERMINOLOGY

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

3. REQUIREMENTS

3.1 Sprayable hydrated calcium silicate insulation shall be composed predominantly of calcium silicate mineral or refractory fibres and a suitable proportion of inorganic, heat-resistant binder. The binder and the fibres shall be uniformly blended and shall not separate during normal handling and spraying operations. The fibre content shall be less than 15 percent.

3.2 Density — The applied and dried density of the material shall be in the range of 160-350 kg/m^3 and shall not vary by more than ± 10 percent from the value declared by the manufacturer. The method of determination of density shall be as prescribed in **4** of IS : 5688-1970†.

3.3 Compressive Strength — Compressive strength of the material shall be as given below when tested in accordance with the method as prescribed in **7** of IS : 5724-1970‡.

Deformation, Percent	*Compressive Strength*, kPa (kN/m^2), *Min*
5	285
10	500

3.4 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 in* W/m.K
100	0·069
200	0·081
300	0·097
400	0·117
500	0·144

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

†Methods of test for preformed block-type and pipe-covering type thermal insulation.

‡Methods of test for thermal insulation cements.

§Method for the determination of thermal conductivity of thermal insulation materials (two slab, guarded hot-plate method) (*first revision*).

3.5 Adhesion — Adhesion of dried thermal insulation to steel shall be 3·65 kN/m^2. The method of test shall be as prescribed in **10** of IS : 5724-1970* except that the insulation shall be sprayed into a 50 mm deep test mould and consolidated to a level surface with a tamp, darby or trowel, and all the wet overspray shall be removed carefully from the test plate and outer mould frame. The test specimen shall be air-dried for 24 h before oven-drying to a constant mass.

3.6 Heat Resistance — The material shall not suffer visible deterioration when tested by heating to the maximum recommended temperature of use in accordance with the method prescribed in **9** of IS : 5724-1970* and **6** of IS : 5688-1970†. At increasing temperatures, the material shall be deemed suitable for use under conditions of soaking heat for 24 hours up to the specified temperature at which the following requirements are met:

a)	Linear shrinkage	2 percent, *Max*
b)	Loss in mass	15 percent, *Max*
c)	Compressive strength reduction in thickness under a load of 345 kN/m^2	10 percent, *Max*

3.7 Incombustibility — When tested in accordance with the method prescribed in **15** of IS : 3144-1981‡, the material shall be found to be incombustible.

3.8 Moisture Content — The moisture content of the sprayed applied hydrated calcium silicate insulation shall not exceed 7·5 percent when tested by the moisture meter.

3.9 Optical Requirement — If required by the purchaser, the material shall also comply with the optional requirement given in **3.9.1**.

3.9.1 *Fire Protection* — When the material is to be used for fire protection, it shall satisfy the time-temperature curve as agreed to between the purchaser and the supplier.

4. PACKING AND MARKING

4.1 Packing — Sprayable hydrated calcium silicate insulation shall be packed in the manufacturer's standard commercial containers or as agreed to between the purchaser and the manufacturer.

*Methods of test for thermal insulating cements.

†Methods of test for preformed block-type and pipe covering type thermal insulation (*first revision*).

‡Methods of test for mineral wool thermal insulation materials (*first revision*).

4.2 Marking — The containers shall be legibly and indelibly marked with the following information:

a) Manufacturer's name and recognized trade-mark, if any;

b) Batch number or month/year of manufacture;

c) Net mass of contents;

d) Recommended temperature range of use; and

e) Density of the material.

4.2.1 Information on spray apparatus and method of application and drying shall be furnished along with the supply.

4.2.2 The material may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and the Regulations made thereunder. The ISI mark on products covered by an Indian Standard conveys the assurence that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. SAMPLING

5.1 Representative samples of the material shall be drawn and their conformity determined in accordance with the method prescribed in Appendix A.

APPENDIX A

(*Clause* 5.1)

SAMPLING OF SPRAYABLE HYDRATED CALCIUM SILICATE INSULATION

A-1. SCALE OF SAMPLING

A-1.1 Lot — All containers of sprayable hydrated calcium silicate insulation belonging to the same batch of manufacturers, in a single consignment, shall be grouped together and each such group shall constitute a lot.

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

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

TABLE 1 NUMBER OF UNITS TO BE SELECTED FOR SAMPLING

LOT SIZE (N)	NUMBER OF UNITS TO BE SELECTED (n)
(1)	(2)
Up to 25	1
26 to 50	2
51 to 100	3
101 and above	4

A-1.3.1 These containers shall be selected at random. In order to ensure the randomness of selection, random sampling procedures given in IS : 4905-1968* shall be adopted.

A-2. PREPARATION OF TEST SAMPLE AND NUMBER OF TESTS

A-2.1 From each of the bags selected according to **A-1.3**, approximately equal quantity of the material shall be taken and thoroughly mixed to form a composite sample weighing not less than 60 kg which would be sufficient for carrying out triplicate determination of all characteristics given in 3.

A-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 the referee sample.

A-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.

A-2.1.3 The referee test sample shall bear the seal of both the purchaser and the supplier. It shall be kept at a place agreed to between the purchaser and the supplier to be used in case of any dispute between the two.

A-2.2 Tests for determination of all characteristics given in 3 shall be conducted on the composite sample, by preparing the samples as given in **A-2.2.1**.

*Methods for random sampling.

A-2.2.1 *Preparation of Samples* — Place a 650 × 650 mm square steel frame, 50 mm deep, upon a horizontal polythene lined base such as plywood, plaster board. Apply the insulation to the depth of the form in the manner prescribed by the manufacturer. Air dry the insulation until successive measurements of mass, taken at 24 hours intervals do not vary by more than 1 percent. After drying, cut a 600 × 600 mm square specimen from the centre position. Use this for determination of density, after which it may be cut for subsequent testing. If necessary, more samples may be prepared in this manner for testing for various requirements in accordance with the methods of test as prescribed in 3.

A-3. CRITERIA FOR CONFORMITY

A-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 requirement given in 3.