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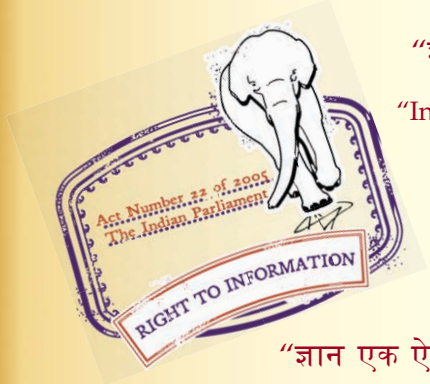

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SPECIFICATION FOR GYPSUM PLASTER FOR USE IN THE MANUFACTURE OF FIBROUS PLASTER BOARDS

(First Revision)

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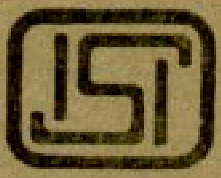

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(First Revision)

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Indian Standard

SPECIFICATION FOR GYPSUM PLASTER FOR USE IN THE MANUFACTURE OF FIBROUS PLASTER BOARDS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 28 September 1984, after the draft finalized by the Gypsum Building Materials Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Gypsum building plasters are used extensively in many countries of the world including Australia, Canada, United Kingdom, United States of America and USSR for general building operations and for the manufacture of preformed gypsum building products which have the specific advantages of lightness and high fire resistance. This specification applies to calcined gypsum plaster for use in the manufacture of fibrous plaster boards which are used as coverings for walls, ceilings and partitions in normally dry environments in buildings.

0.3 This standard was first published in 1976. This revision has been taken up with a view to up-dating the standard based on the current knowledge on the subject. In this revision chemical composition and initial setting time of plaster have been modified.

0.4 In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. While formulating this standard assistance has been derived from AS A43-1963 'Gypsum plaster for building purposes', issued by the Standards Association of Australia.

0.5 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 value in this standard.

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1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and tests for calcined gypsum plaster used in manufacturing fibrous plaster boards covered in IS : 8273-1984†.

2. CHEMICAL COMPOSITION

2.1 The plaster shall consist essentially of calcium sulphate hemihydrate ($CaSO_4.\frac{1}{2}H_2O$) and shall contain not less than 42 percent sulphur trioxide (SO_3) as determined by the method described in IS : 1288-1982‡.

2.2 Impurities insoluble in ammonium acetate shall not exceed 10 percent when tested by the method given in Appendix A.

2.3 The chloride content, expressed as sodium chloride shall not exceed 0·2 percent when tested by the method given in Appendix B.

3. PROPERTIES

3.1 Fineness — The residue retained on 600 μm IS Sieve shall not be more than 1 percent by mass when determined by the method described in Appendix C.

3.2 Compressive Strength — The compressive strength of the plaster, when determined by the method described in Appendix D shall not be less than 7·6 N/mm^2.

3.3 Setting Time

3.3.1 *Initial Setting Time* — When determined by the method given in Appendix E, the time of initial set of the plaster, unless otherwise agreed between the purchaser and the manufacturer, shall be between 20 and 35 minutes.

---

*Rules for rounding off numerical values (*revised*).
†Specification for fibrous gypsum plaster boards (*first revision*).
‡Methods of test for mineral gypsum (*second revision*).

4. SAMPLING

4.1 Lot — In any consignment, all the packages of the gypsum plaster of the same class and type, and from the same batch of manufacture shall be grouped together to constitute a lot.

4.1.1 Samples shall be selected and tested separately from each lot to determine its conformity or otherwise to the requirements of the specification.

4.2 The number of packages to be selected for the sample from a lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 1.

TABLE 1 NUMBER OF PACKAGES TO BE SELECTED FROM THE LOT

LOT SIZE	SAMPLE SIZE
(1)	(2)
Up to 100	3
101 to 150	4
151 to 300	5
301 to 500	7
501 and above	10

4.2.1 The packages for the sample shall be selected at random from the lot and in order to ensure the randomness of selection the procedures given in IS : 4905-1968* may be adopted.

4.3 Number of Tests

4.3.1 The contents of each package in the sample shall be thoroughly homogenized by mixing separately and sufficient quantity of gypsum plaster shall then be drawn from each package separately for carrying out the tests for setting time, compressive strength and fineness. These samples of gypsum plaster drawn from each package shall be kept separately and tested individually for each of the tests mentioned above. The samples should be placed immediately in clean, dry, air-tight containers for delivering to the laboratory.

4.3.2 The test for the remaining requirements shall be carried out on a composite sample prepared by thoroughly mixing equal quantities of gypsum plaster taken from each of the packages selected in the sample.

*Methods for random sampling.

4.4 Criteria for Conformity — A lot shall be considered as conforming to the requirements of this standard if the conditions mentioned in **4.4.1** and **4.4.2** are satisfied.

4.4.1 For test results on setting time, compressive strength and fineness, the average (X) and the range (R) shall be calculated. From the corresponding average and range value for each characteristics the value of the expressions $X \pm 0{\cdot}4R$ shall be calculated. The value of the expression $X - 0{\cdot}4R$ as calculated above shall be greater than or equal to the minimum limits specified, and the value of the expression $X + 0{\cdot}4R$ shall be less than or equal to the maximum limit specified.

4.4.2 All the test results for remaining requirements tested on the composite sample shall satisfy the corresponding specification requirements.

5. PACKING AND MARKING

5.1 The plaster shall be dry and free from lumps and shall be suitably packed in water-tight bags or containers. The following information shall be marked legibly on each package:

a) Name of the manufacturer,

b) Class of plaster,

c) Date of manufacture, and

d) Net weight.

5.1.1 Each package 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 Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance 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.

APPENDIX A

(*Clause* 2.2)

METHOD FOR DETERMINATION OF IMPURITIES INSOLUBLE IN AMMONIUM ACETATE SOLUTION

A-1. REAGENTS

A-1.1 Ammonium Acetate Solution — Ammonium acetate shall be of the analytical reagent quality. It shall be prepared by dissolving 450 g of ammonium acetate in 2 litres of distilled water conforming to IS : 1070-1977*. The solution shall be made distinctly alkaline by adding sufficient quantity of ammonium hydroxide, phenolphthalein being used as indicator.

A-1.2 Ammonium Hydroxide Wash Solution — Dilute 100 ml of ammonium hydroxide (sp gr 0·88) to one litre.

A-1.3 Filter Aid — Analytical grade diatomaceous silica. This is optional.

A-2. PROCEDURE

A-2.1 Grind the sample so that it passes completely through 250 μm IS Sieve. Take 4 g of dried sample in a beaker and add 350 ml of ammonium acetate solution. The mixture shall be stirred thoroughly to loosen all solid matter from the bottom of the beaker. Heat the contents to approximately 70°C for 30 minutes, stirring being done frequently. To facilitate filtering, an accurately weighed sample of diatomaceous silica, say 2 g, may be added either before or during heating. By adding ammonia keep the solution alkaline as indicated by phenolphthalein. Using suction, filter the mixture through a tared Gooch crucible and wash the filtrate several times with warm ammonium acetate solution. Then thoroughly wash the filtrate with warm ammonium hydroxide washsolution. Dry the crucible alongwith the contents to constant mass in an air oven at 70°C. Cool in a desiccator and then weigh. The mass of filter aid, if used, shall be subtracted.

A-3. REPORT OF TEST RESULTS

A-3.1 The difference in mass shall give the impurities insoluble in ammonium acetate solution and this shall be expressed in percentage.

*Specification for water for general laboratory use (*second revision*).

APPENDIX B

(*Clause* 2.3)

METHOD FOR DETERMINATION OF CHLORIDES

B-1. REAGENTS

B-1.1 Silver Nitrate Solution — 0·05 N.

B-1.2 Strong Nitric Acid — Dilute 25 ml concentrated nitric acid in 100 ml distilled water, boil and cool.

B-1.3 Dilute Nitric Acid — 1 : 99 (*v/v*).

B-1.4 Ferric Alum Indicator — Approximately 40 percent mass per volume.

B-1.5 Ammonium Thiocyanate Solution — 0·05 N.

NOTE — All reagents shall be of analytical quality.

B-2. PROCEDURE

B-2.1 Take 1 to 6 g of sample in a beaker, add 5 to 20 ml of silver nitrate solution (0·05 N) depending on the chloride content. The amount of solution added should be 2-3 ml in excess of the amount required to precipitate all the chloride. Cover the beaker with glass and add the strong nitric acid (25 : 100) carefully. Heat the mixture gently on a hot plate and stir until the plaster is dissolved completely. Add 100 ml of hot water and digest the mixture for about 5 minutes with occasional stirring. Allow the contents to stand for a few minutes and then filter the contents through a Buchner funnel.

B-2.2 Wash the filtrate three times with dilute nitric acid (1 : 99) and finally with hot water until the residue is free from silver nitrate. Cool the filtrate to room temperature add transfer it to a porcelain dish. Add about 3 to 5 ml of ferric alum indicator and titrate the residual silver nitrate with ammonium thiocyanate solution (0·05 N). During titration stir the solution vigorously with a glass rod until faint reddish-brown colour appears permanently.

B-3. REPORT OF TEST RESULTS

B-3.1 Calculate the chloride content as sodium chloride. Take one ml 0·05 N silver nitrate as equivalent to 0·002 923 g of sodium chloride. Average of three test results shall be reported as chloride content.

APPENDIX C

(*Clause* 3.1)

METHOD FOR DETERMINATION OF FINENESS

C-1. PROCEDURE

C-1.1 One hundred gram of the dried sample shall be shifted continuously on a 600 μm IS Sieve for five minutes. Air set lumps in the sample may be broken down with the fingers but nothing shall be rubbed on the sieve. The mass of the material retained on the sieve shall be expressed as a percentage of the original mass of the sample.

APPENDIX D

(*Clause* 3.2)

METHOD FOR DETERMINATION OF COMPRESSIVE STRENGTH

D-1. TEST SPECIMEN

D-1.1 A sample of approximately 900 g shall be mixed with sufficient water to form a paste of standard testing consistency as described in Appendix F and shall be cast in five 50-mm cube mould conforming to IS : 10086-1982*. The cubes shall be levelled off flush with the top of the moulds. The cubes in their moulds shall be retained over water in a closed vessel at room temperature for 24 hours. The specimens shall then be removed from the moulds and dried at a temperature of not more than 40°C. The specimens shall be weighed at intervals of not less than one hour and drying shall be considered complete when the mass has become constant to within 0·1 percent.

D-2. PROCEDURE

D-2.1 As soon as the cube specimens have been dried, they shall be cooled at room temperature for 15 minutes and their compressive strength determined. The rate of loading on the specimen shall be such that the breaking strength of the cube is reached in not less than 20 s and not more than 80 s.

*Specification for moulds for use in tests of cement and concrete.

D-3. REPORT

D-3.1 The average compressive strength of the five cube specimens, shall be reported as the compressive strength of the sample. If the strength of one or two cubes vary more than 15 percent from the average of the five, they shall be discarded and the compressive strength shall be reported as the average of the remaining specimens.

APPENDIX E

(*Clause* 3.3.1)

METHOD FOR DETERMINATION OF SETTING TIME

E-1. APPARATUS

E-1.1 Setting Dish — Any open container of uniform internal depth of 10 mm manufactured from non-absorbent corrosion resistant material and capable of retaining at least 200 g of mixture.

E-1.2 Grooving Instrument — The grooving instrument shall consist of a stiff, parallel sided, square edged blade, 0·5 ± 0·05 mm in thickness and manufactured from corrosion resistant material.

E-1.2.1 A suitable instrument is illustrated in Fig. 1.

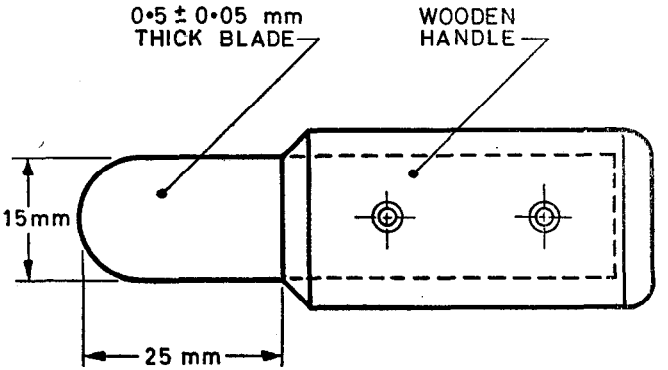

FIG. 1 GROOVING INSTRUMENT

E-2. PROCEDURE

E-2.1 A mixture of standard testing consistency, as previously determined by the method described in Appendix F, shall be prepared by adding plaster to a known quantity of water and mixing by the method laid down in **F-2.2.** The mixture shall then be transferred to the setting dish and struck off level to a depth of 10 mm. Incisions 10 mm deep and at least 50 mm long shall be made with the grooving instrument in the mixture at convenient time intervals until the mixture commences to stiffen and then at one minute intervals until the mix stiffening has advanced to such an extent that the incisions, when once made, remain open for their full length and depth.

E-2.2 Setting Time — The setting time shall be reckoned from the time at which the plaster is added to the mixing water until the time at which the incision, when once made, remain open for their full length and depth.

APPENDIX F

(*Clauses* D-1.1 *and* E-2.1)

METHOD FOR DETERMINATION OF STANDARD TESTING CONSISTENCY

F-1. APPARATUS

F-1.1 Ring Mould — The ring mould shall be a hollow cylinder manufactured from non-absorbent corrosion resistant material. The cylinder shall have the dimensions as given below:

Internal diameter	35 mm
Height (length)	50 mm

F-1.2 Base Plate — The base plate shall be of plate glass approximately 200 mm square.

F-2. PROCEDURE

F-2.1 The clean dry base plate shall be placed in a horizontal position with the ring mould centered on it.

F-2.2 Approximately 75 g of the plaster shall be shifted in 15 s into a known volume of water in a mixing bowl and allowed to stand for a further 30 s while the bowl is tapped to dislodge air bubbles. The mixture shall then be spatulated for 60 s with a stiff bladed spatula and transferred to the ring mould, care being taken that the mould is completely filled. Two minutes from the time of starting the mix, the mould shall be lifted vertically and the mixture allowed to slump or spread over the base plate. One minute after the mould is lifted the maximum and minimum diameters of spread of the slumped mixture shall be measured. The procedures shall be repeated until a mix of standard testing consistency in accordance with **F-3** is obtained.

F-3. STANDARD CONSISTENCY

F-3.1 The mixture shall be considered of standard testing consistency when the average of the maximum and minimum diameters of spread, obtained when tested in accordance with **F-2** is within the limits (100 $\pm$ 3 mm). Standard testing consistency shall be expressed as the number of millilitres of water required to be added to 100 g of plaster.

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