*भारतीय मानक* IS 2542 (Part 1/Sec 5) : 2023

*Indian Standard*

# जिप्सम प्लास्टर, कंक्रीट और उत्पाद — परीक्षण पद्धति

## भाग 1 प्लास्टर और कंक्रीट

## अनुभाग 5 जिप्सम प्लास्टर के संपीड़न सामर्थ्य और ड्राई सेट घनत्व का निर्धारण

*( दूसरा पुनरीक्षण )*

# Gypsum Plaster, Concrete and Products — Methods of Test

## Part 1 Plaster and Concrete

### Section 5 Determination of Compressive Strength and Dry Set Density of Gypsum Plaster

*( Second Revision )*

ICS 91.100.10



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Building Limes and Gypsum Products Sectional Committee, CED 04

FOREWORD

This Indian Standard (Part 1/Sec 5) (Second Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Building Limes and Gypsum Products Sectional Committee had been approved by the Civil Engineering Division Council.

Over the last few years, the consumption of gypsum and gypsum based product has increased. Gypsum is utilized in the manufacture of cement, plaster of Paris, drywall, etc, the major source of supply of gypsum in the country is from the state of Rajasthan. It is also mined in Tamil Nadu, Uttar Pradesh and to a smaller extent in Gujarat, Jammu and Kashmir, and Maharashtra.

Calcined gypsum is used in the plasters and manufacture of plaster of Paris. It is also used in the manufacture of partition blocks, sheets and tiles, plaster and insulating boards, and for stucco and lattice works. Gypsum in crushed condition is utilized in Portland cement manufacture, where it acts as a retarder, controlling the setting time of cement. Gypsum blocks are also used as building stones. Ground gypsum, as filler, is utilized in paint, paper, rubber, textiles, etc. In pottery, gypsum is used for moulding purposes. Besides, gypsum rock is used as a flux in the smelting of nickel ores and in tin plate industry for polishing plates.

A number of Indian Standards on gypsum building materials covering specifications, code of practices, etc have been prepared with a view to assisting the gypsum industry in its development. In line with that, methods of test for gypsum plaster, concrete and products, IS 2542 was prepared in two parts in the year 1964 and revised subsequently in 1978.

Part 1 of IS 2542 covered, the methods of test for gypsum plaster and gypsum concrete, and Part 2 of IS 2542 covered, the methods of test for gypsum products.

In this revision, it was decided to review and update the various existing test methods of gypsum, taking into consideration the latest international practices and developments in this field and the current practices in the country. The significant changes incorporated in this revision of IS 2542 (Part 1) are as follows:

a) New test method for determination of free water has been introduced;
b) New test method for determination of fineness has been introduced;
c) Test specimen clause has been elaborated;
d) Clause relating to the reporting of test results has been described separately; and
e) Reference to various Indian Standards has been updated.

In this revision, IS 2542 (Part 1) is split into separate sections adding two new parts. This (Part 1/Section 5) covers compressive strength and dry set density of gypsum plaster. The other standards in the series are:

| | |
|---|---|
| Section 1 | Determination of normal consistency of gypsum plaster |
| Section 2 | Determination of normal consistency of gypsum concrete |
| Section 3 | Determination of setting time of plaster and concrete |
| Section 4 | Determination of transverse strength of gypsum plaster |
| Section 6 | Determination of soundness of gypsum plaster |
| Section 7 | Determination of impact resistance of gypsum plaster by dropping ball test |
| Section 8 | Determination of mass from coarse particles |
| Section 9 | Determination of expansion of gypsum plaster |
| Section 10 | Determination of sand in set gypsum plaster |
| Section 11 | Determination of wood fibre content in wood fibre gypsum plaster |
| Section 12 | Determination of dry bulk density |
| Section 13 | Determination of free water |
| Section 14 | Determination of fineness |

(*Continued on third cover*)

*Indian Standard*

# GYPSUM PLASTER, CONCRETE AND PRODUCTS — METHODS OF TEST

## PART 1 PLASTER AND CONCRETE

### SECTION 5 DETERMINATION OF COMPRESSIVE STRENGTH AND DRY SET DENSITY OF GYPSUM PLASTER

*( Second Revision )*

## 1 SCOPE

This standard (Part 1/Sec 5) covers the procedure for determining the compressive strength and dry set density of gypsum plaster.

## 2 REFERENCES

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

| *IS No.* | *Title* |
|---|---|
| IS 650 : 1991 | Standard sand for testing cement — Specification (*second revision*) |
| IS 2542 (Part 1/ Sec 1) : 1978 | Methods of test for gypsum plaster, concrete and products: Part 1 Plaster and concrete, Section 1 Determination of normal consistency of gypsum plaster (*first revision*) |
| IS 2469 : 2023 | Glossary of terms relating to gypsum (*second revision*) |

## 3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2469 shall apply.

## 4 OBJECTIVE

This test method is intended to determine the compressive strength as well as dry set density of gypsum plaster.

## 5 APPARATUS

**5.1 Balance** — capable of weighing at least 500 g at an accuracy of ± 0.1 g

**5.2 Drying Oven** — capable to maintain 45 °C ± 3 °C

**5.3 Cube Moulds**

The moulds for 50 mm cube specimens shall be made of non-corrodible material and shall be of sufficient strength and stiffness to prevent spreading and warping. The moulds shall be rigidly constructed in such a manner as to facilitate the removal of the moulded specimen without damage. The moulds shall have not more than three compartments and shall be separable into not more than two parts. The moulds shall be machined so that when assembled ready for use the dimensions and internal faces shall be accurate to the following limits:

a) The height of the moulds and the distance between the opposite faces shall be 50 mm ± 0.1 mm for new moulds and 50 mm ± 0.5 mm for moulds in use.

b) The angle between adjacent interior faces and between interior faces and top and bottom planes of the mould shall be 90° ± 0.5°.

c) The interior faces of the moulds shall be plane surfaces with a permissible variation of 0.02 mm for new moulds and 0.05 mm for moulds in use.

d) Each mould shall be provided with a base plate having a plane surface machined to a tolerance of 0.1 mm and made of non-absorbent and non-corrodible material. The base plate shall be of such dimensions as to support the mould during the filling without leakage.

## 6 SAMPLE PREPARATION

Stabilize the plaster before use in tests as given in Annex A. Mix sufficient sample at normal consistency [*see* IS 2542 (Part 1/Section 1)] to produce not less than 1 000 ml of mixed mortar and cast into six 50 mm split cube moulds. Neat gypsum plaster shall be premixed dry with two parts by

weight of standard sand as per IS 650. No retarder shall be added. Place the required amount of water in a clean 2.5 litres mixing bowl. The temperature of water shall be 27 °C ± 2 °C. For all gypsum plasters except gypsum concrete, add the required amount of dried plaster and allow to soak for 2 min. Mix vigorously for one minute with a metal spoon or stiff bladed spatula to produce a mortar of uniform consistency. For gypsum concrete, soak for 1 min and stir vigorously (about 150 complete circular strokes per minute) with a large metal spoon for 3 min.

## 7 DETERMINATION OF DRY SET DENSITY

### 7.1 Procedure

The mould shall be coated with a thin film of mineral oil and placed on an oiled glass or metal plate. Place a layer of mortar about 25 mm in depth in each mould and puddle ten times across the mould between each pair of opposite faces with a 25 mm wide metal spatula to remove air bubbles. Fill the moulds to a point slightly above the tops of the moulds by the same filling and puddling procedure used for the first operation. After the mortar or paste has been set, cut off the excess to a plane surface flush with the top of the mould. Place the filled moulds in moist air (90 percent to 100 percent humidity). The cubes may be removed from the moulds as soon as thoroughly hardened but shall be retained in the moist air for not less than a total of 24 h. Place the cubes in an oven provided with air circulation and adequate ventilation for removal of moisture so that the air may be maintained at a temperature of 30 °C to 45 °C and relative humidity not to exceed 50 percent. Dry the cubes to a constant weight as determined by weighing once each day but not to exceed 7 days.

### 7.2 Report

Weigh the six dry cubes and determine the dry set density in kg/$m^3$.

## 8 DETERMINATION OF COMPRESSIVE STRENGTH

### 8.1 Procedure

As soon as the cube specimens have been dried, determine their compressive strengths. Position the cubes in the testing machine so that the load is applied on surfaces formed by faces of the moulds, not on top and bottom. Apply the load continuously and without shock at a constant rate within the range 1 kgf/$cm^2$ to 4 kgf/$cm^2$ (98 kN/$m^2$ to 392 kN/$m^2$) per second. During the application of the first half of the maximum load, a higher rate of loading shall be permitted.

### 8.2 Report

The average compressive strength shall be reported as the compressive strength of the material, except that if the strengths of one or two of the 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. In case the compressive strengths of three or more cubes vary more than 15 percent from the average, the results shall be discarded and the test repeated.

NOTE — For the compressive strength of gypsum concrete, only (50 ± 0.2) mm × (100 ± 0.2) mm cylinder moulds may be used instead of cube moulds. Prepare the specimens as described in **6**, except that the paste shall be struck off to a smooth surface flush with the tops of the moulds immediately after the moulds are filled.

## ANNEX A

(*Clauses* 6)

## METHOD FOR STABILIZING GYPSUM PLASTER

**A-1** Plaster shall be stabilized before use in the tests for compressive strength, transverse strength, mechanical resistance and expansion on setting as below:

a) For this purpose, the plaster shall be exposed for 24 h in a layer not more than 12.5 mm in thickness to an atmosphere of 75 percent ± 3 percent relative humidity at a temperature of 27 °C ± 2 °C with vigorous air circulation over the specimen throughout this period.

The humidity may be maintained by a saturated solution of sodium chlorate contained together with the solid salt in a wide dish and placed in a tightly closed cabinet. The air in the cabinet should be kept moving over both solution and plaster.

## ANNEX B

(*Foreword*)

## COMMITTEE COMPOSTION

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(*Continued from second cover*)

The composition of the Committee responsible for the formulation of this standard is given in Annex B.

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 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. 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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## Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
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