भारतीय मानक

Indian Standard

IS 12679 : 2023

निर्माण के लिए उप-उत्पाद जिप्सम — विशिष्टि

(दूसरा पुनरीक्षण)

By-Product Gypsum for Construction — Specification

(Second Revision)

ICS 91.100.10

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FOREWORD

This Indian Standard (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.

The by-product gypsum is calcium sulfate that occurs as a by-product of industrial processes. It is formed by the action of sulphuric acid on calcium salts. By-product gypsum is also known as chemical gypsum or synthetic gypsum. Some of the important by-product gypsums are phospho-gypsum, fluoro-gypsum or anhydrite, marine gypsum and sulpho-gypsum or flue gas desulphurization (FGD) gypsum. With control quality of by-product gypsum, it is suitable for use in the construction activities such as plasters, drywall (wallboard or plasterboard), ceiling tiles, partitions, building blocks, finishing mortar, wall-surface putty, high strength gypsum sticky powder, whitewashing gypsum, construction of road bases and subbases, raw material for cement production and other different types gypsum elements.

Phospho-gypsum is obtained as a by-product in the manufacture of phosphoric acid by wet process. It is a waste material posing serious problems of disposal. There is the danger of water pollution if the material is discharged on the ground or into water bodies, as this organic and inorganic content of this material would make the water unsuitable for human and animal consumption and for agricultural purposes. It is used to some extent in alkaline soil reclamation and in the production of ammonium sulphate fertilizer. Phosphogypsum contains phosphates, fluorides, alkalies and organic matter as impurities, and these impurities are known to adversely affect the setting and strength development of plaster made from it.

Fluoro-gypsum is produced as a by-product during the manufacture of hydrofluoric acid. It contains impurities, namely, calcium fluoride and some free acidic materials.

Marine gypsum is obtained during the process of recovering common salt by solar evaporation of seawater. It contains impurities such as sodium chloride and clay adhering to it. Most of the salt manufacturers in the coastal regions of Gujarat, Maharashtra and Tamil Nadu recover marine gypsum as a by-product of the salt industry.

The sulpho-gypsum is produced as a by-product during desulphurization of flue gas produced from the combustion of coal in power plants. The limestone slurry is used for scrubbing oxides of sulphur in flue gas and producing sulpho-gypsum as a byproduct. It is also known as flue gas desulphurization gypsum or FGD gypsum.

This standard was first formulated in 1989 and revised subsequently in 2021. This revision has been brought out to incorporate the modification based on the experience gained in the use of this standard since its publication. Significant changes incorporated in this revision are as follows:

a) Name of this Indian Standard has been changed from ‘By-product gypsum for use in plaster, blocks and boards — specification’ to ‘By-product gypsum for construction — Specification’ for wider acceptability and utilization by the construction sector;
b) Requirement of Flue Gas Desulphurization (FGD) gypsum has been aligned with the guideline for circular economy regarding the use of byproduct gypsum issued by the government;
c) Provision for bulk supply of by-product gypsum has been included;
d) Sampling clause has been elaborated; and
e) References to various Indian Standards have been updated.

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

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.

Indian Standard

BY-PRODUCT GYPSUM FOR CONSTRUCTION — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers the requirements of by-product gypsum suitable for construction.

2 REFERENCES

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

IS No.	*Title*
IS 1288 : 1982	Methods of test for mineral gypsum (*second revision*)
IS 2411 : 1963	Methods of chemical analysis of fluorspar (fluorite)
IS 2720	Methods of test for soils:
(Part 22) : 1972	Determination of organic matter (*first revision*)
(Part 26) : 1987	Determination of *p*H value (*second revision*)
IS 4879 : 2023	Method of sub-division of gross sample of powder used for detemination of particle size
IS 6092 (Part 3/ Sec 2) : 2004	Method of sampling and test for fertilizers: Part 3 Determination of phosphorus, Section 2 Test methods not covered under dual number standards (*second revision*)
IS 6361 : 1971	Methods of colorimetric determination of phosphorus
IS 9497 : 1980	Method for determination of sodium and potassium (flame photometric)
IS 10170 : 1982	Specification for by-product gypsum

3 TYPES OF BY-PRODUCT GYPSUM

The by-product gypsum in accordance with this standard may be of the following types:

a) Phospho-gypsum;
b) Fluoro-gypsum;
c) Marine-gypsum; and
d) Sulpho-gypsum (FGD gypsum).

4 REQUIREMENTS

By-product gypsum shall conform to the requirements given in Table 1.

5 SAMPLING AND CRITERIA FOR CONFORMITY

5.1 Lot

The quantity of by-product gypsum from the same manufacturing unit not exceeding 25 000 t shall constitute a lot. The samples shall be selected and examined for each lot separately for ascertaining their conformity to the requirements of this standard.

NOTE — In case of phospho-gypsum stored for a prolonged period (six months and above) before dispatch, the lot shall constitute of 100 000 t or quantity dispatched in a month, whichever is less.

5.2 Sample Preparation

Collect approximately 5 kg of sample from at least 10 random locations of a lot by using pipe sampler or any other appropriate sampling equipment. Mix thoroughly the collected sample and prepare 1.5 kg of sample for analysis, by using incremental reduction method or coning and quartering method. Divide the above samples into 10 equal square parts with base height of Min 5 mm. Divide each square in 4 equal parts and collect the two diagonally opposite parts materials. Mix the collected sample properly and perform tasting. For detailed guidelines on the sampling and sample splitting technique, refer IS 4879.

Table 1 Requirements of By-Product Gypsum

(*Clause* 4)

Sl No.	Characteristic	Requirement				Method of Test, Ref to
		Phospho-gypsum	Fluoro-gypsum	Marine Gypsum	Sulpho-gypsum (FGD gypsum)	
(1)	(2)	(3)	(4)	(5)	(6)	(8)
i)	P_2O_5, percent by mass, *Max*	1.20	–	–	0.40	IS 6361 (*see* Note 2)
ii)	F, percent by mass, *Max*	0.50 (*see* Note 3)	1.00	–	0.40	IS 2411
iii)	Na_2O, percent by mass, *Max*	0.30	–	–	0.20	IS 9497
iv)	K_2O, percent by mass, *Max*	0.20	–	–	0.20	IS 9497
v)	Organic matter, percent by mass, *Max*	0.15	–	–	–	IS 2720 (Part 22)
vi)	$CaSO_4.2H_2O$, percent by mass, *Min*	85.0	90.0 (*see* Note 4)	85.0	83.0	IS 1288
vii)	Cl as NaCl, percent by mass, *Max*	0.10	–	0.10	0.02	IS 1288
viii)	*p*H of 10 percent aqueous suspension of gypsum, *Min*	2.0	5.0	6.0	5.0	IS 5741
ix)	free water, percent by mass, *Max*	–	–	–	13.0	IS 1288

NOTES

1 If the impurities in by-product gypsum exceed the specified limits, it should be processed to bring down the level of impurities according to the standard requirements.

2 Maximum percentage by mass of P_2O_5 may be determined as per IS 6092 (Part 3/Sec 2). However, in case of dispute the method given in IS 6361 will be the referee method.

3 *F*, percent by mass, *Max* shall be determined as per IS 10170 instead of IS 2411 for phospho-gypsum.

4 Fluorogypsum shall be in anhydrous form (as $CaSO_4$).

5.3 Criteria for Conformity

Composite samples drawn in accordance with **5.2** shall be tested for all requirements of Table 1. The lot shall be considered passing if samples meet in all the requirements of Table 1.

6 DELIVERY

The supply of by-product gypsum shall be made in suitable quantities mutually agreed to between the purchaser and the manufacturer. Where so required by the purchaser, the material shall be supplied in bags, drums, tankers, dumpers, containers, rail wagons, barges, or ship.

7 MANUFACTURER'S CERTIFICATE

The manufacturer shall satisfy himself that the by-product gypsum conforms to the requirements of this standard and, if requested by the purchaser, shall furnish a certificate to this effect, indicating the results of the tests carried out on that lot of by-product gypsum.

8 MARKING

8.1 Each bag/drum of by-product gypsum shall be clearly and permanently with the following information:

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

b) The words 'by-product gypsum' and type of by-product gypsum (*see* **3**); and

c) Net quantity of by-product gypsum.

NOTE — Supplies of by-product gypsum may be made in 50 kg, 100 kg and 200 kg or as per the agreement between the purchaser and the manufacturer.

8.2 Similar information as given in **8.1** shall be provided in the delivery advice accompanying the shipment of bulk supply of by-product gypsum.

NOTE — A single bag or container containing 1 000 kg and more, net quantity of by-product gypsum shall be considered as the bulk supply of by-product gypsum.

8.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSTION

Building Limes and Gypsum Products Sectional Committee, CED 04

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School of Planning and Architecture, New Delhi	PROF ANURADHA CHATURVEDI **(*Chairperson*)**
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DR MANOJ KUMAR RAJAK
SCIENTIST 'D'/JOINT DIRECTOR
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Bureau of Indian Standards

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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