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भारतीय मानक
जल विरोधी पोर्टलैंड सीमेंट — विशिष्टि
(दूसरा पुनरीक्षण)

Indian Standard

HYDROPHOBIC PORTLAND CEMENT —
SPECIFICATION

(Second Revision)

(Incorporating Amendment Nos. 1, 2 & 3)

UDC 666.942.4/7

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BUREAU OF INDIAN STANDARDS
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Price Group 3

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

Hydrophobic cement deteriorates very little during prolonged storage under unfavourable conditions. This cement is obtained by intergrinding 33 grade ordinary Portland cement clinker with certain hydrophobic agents which will impart to the cement a water repelling property. The hydrophobic properties are due to the formation of a water repellent film around each particle of cement. This film is broken during the mixing of the concrete, and normal hydration takes place. Hydrophobic cement shall not be confused with waterproofing cements. A test on hydrophobicity is also included in this standard.

This standard was first issued as an emergency standard in 1976 and subsequently revised in 1978. Since publication of the first revision of this standard, amendments have been issued from time to time in order to modify various requirements based on the requirements of the users and also keeping in view the raw materials and fuel available in the country for manufacture of cement. The important amendments include modification in the tolerance requirements for the mass of cement packed in bags, permitting packaging of cement in 25 kg bags, making compulsory provision for issuing a certificate indicating the total chloride content in percent by mass of cement, permitting different bags for packing of cement, incorporating details for considering of supply of cement as bulk supply, etc. In view of these large number of amendments, the Committee decided to bring out the second revision of this standard incorporating all these amendments so as to make it convenient for the users.

Mass of cement packed in bags and the tolerance requirements for the mass of cement packed in bags shall be in accordance with the relevant provisions of the Standards of Weights and Measures (Packaged Commodities) Rules, 1977 and **C-1.2** (see Annex C for information). Any modification in these rules in respect of tolerance on mass of cement would apply automatically to this standard.

The composition of the Technical Committee responsible for the formulation of this standard is given at Annex D.

This edition 3.3 incorporates Amendment No. 1 (November 1991), Amendment No. 2 (November 1993) and Amendment No. 3 (April 2000). Side bar indicates modification of the text as the result of incorporation of the amendments.

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

HYDROPHOBIC PORTLAND CEMENT — SPECIFICATION

(*Second Revision*)

1 SCOPE

This standard covers the manufacture and chemical and physical requirements of hydrophobic Portland cement.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 4845 : 1968 and the following shall apply.

3.1.1 Hydrophobic Cement

Cement obtained by grinding 33 grade ordinary Portland cement clinker with an additive which will impart to ground cement, a water repelling property which shall be destroyed only by wet attrition, such as in concrete mixer. The hydrophobic quality of cement would facilitate its storage for longer periods in extremely wet climatic conditions.

4 MANUFACTURE

4.1 Hydrophobic cement shall be manufactured by intimately mixing together calcareous and argillaceous and/or other silica, alumina or iron oxide bearing materials, burning them at clinkering temperature and grinding the resultant clinker with natural or chemical gypsum and small quantities (0.1 to 0.5 percent by mass of clinker) of a hydrophobic agent.

NOTE — Some of the hydrophobic agents used in the manufacture of hydrophobic cement are oleic acid, naphthenic acid, stearic acid, pentachlorophenol, etc.

5 CHEMICAL REQUIREMENTS

5.1 The chemical requirements of hydrophobic cement shall be as laid in IS 269 : 1989.

6 PHYSICAL REQUIREMENTS**6.1 Fineness**

When tested for fineness in terms of specific surface by Blaine's air permeability method as described in IS 4031 (Part 2) : 1988, the specific surface of the hydrophobic cement shall be not less than 350 m²/kg.

6.2 The physical requirements, such as soundness and setting time shall be as laid down in IS 269 : 1989.

6.3 Compressive Strength

The average compressive strength of at least three mortar cubes (area of face 50 cm²) composed of one part of cement, three parts of standard sand (conforming to IS 650 : 1966) by mass and $P/4 + 3.0$ percent (of combined mass of cement and sand) water, and prepared, stored and tested in the manner described in IS 4031 (Part 6) : 1988 shall be as follows:

- a) 72 ± 1 hours Not less than 15.69 MPa
- b) 168 ± 2 hours Not less than 21.57 MPa
- c) 672 ± 4 hours Not less than 30.40 MPa

NOTE — P is the percentage of water required to produce a paste of standard consistency.

6.4 By agreement between the purchaser and the manufacturer, transverse strength test of plastic mortar in accordance with the method described in IS 4031 (Part 8) : 1988 may be specified in addition to the test specified in **6.3**. The permissible value of the transverse strength for hydrophobic Portland cement shall be mutually agreed to between the purchaser and the supplier at the time of placing order.

6.5 Notwithstanding the strength requirements specified in **6.3** and **6.4**, the cement shall show a progressive increase in strength from the strength at 72 hours.

6.6 Hydrophobicity of the cement shall be tested and accepted in accordance with Annex B.

7 STORAGE, SAMPLING, TESTS AND REJECTION

7.1 Storage, sampling, tests and rejection of hydrophobic cement shall be as laid down in IS 269 : 1989.

8 MANUFACTURER'S CERTIFICATE

8.1 The manufacturer shall satisfy himself that the cement conforms to the requirements of this standard, and if requested, shall furnish a certificate to this effect to the purchaser or his representative within ten days of despatch of the cement.

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8.2 The manufacturer shall furnish a certificate, within ten days of despatch of cement, indicating the total chloride content in percent by mass of cement.

9 DELIVERY

9.1 The cement shall be packed in bags [jute sacking bag conforming to IS 2580 : 1982, double hessian bituminized (CRI type), multiwall paper conforming to IS 11761 : 1986, polyethylene lined (CRI type), jute, light weight jute conforming to IS 12154 : 1987, woven HDPE conforming to IS 11652 : 1986, woven polypropylene conforming to IS 11653 : 1986, jute synthetic union conforming to IS 12174 : 1987 or any other approved composite bags] bearing the manufacturer's name or his registered trade-mark, if any. The words 'Hydrophobic Cement' and the number of bags to a tonne or the nominal net mass (see **9.2**) of the cement shall be marked legibly and indelibly on each bag. Bags shall be in good condition at the time of inspection.

9.1.1 The bags or packages may also be marked with the Standard Mark.

9.2 The net mass of cement per bag shall be 50 kg (see Annex C).

9.2.1 The net mass of cement per bag may also be 25 kg subject to tolerances as given in **9.2.1.1** and packed in suitable bags as agreed to between the purchaser and the manufacturer.

9.2.1.1 The number of bags in a sample taken for weighment showing a minus error greater

than 2 percent of the specified net mass shall be not more than 5 percent of the bags in the sample. Also the minus error in none of such bags in the sample shall exceed 4 percent of the specified net mass of cement in the bag. However, the net mass of cement in a sample shall be equal to or more than 25 kg.

9.2.2 When cement is intended for export and if the purchaser so requires, packing of cement may be done in bags or in drums with net mass of cement per bag or drum as agreed to between the purchaser and the manufacturer.

9.2.2.1 For this purpose the permission of the certifying authority shall be obtained in advance for each export order.

9.2.2.2 The words '**FOR EXPORT**' and the net mass of cement per bag/drum shall be clearly marked in indelible ink on each bag/drum.

9.2.2.3 The packing material shall be as agreed to between the manufacturer and the purchaser.

9.2.2.4 The tolerance requirements for the mass of cement packed in bags/drum shall be as given in **9.2.1.1** except the net mass which shall be equal to or more than the quantity in **9.2.2**.

9.3 Supplies of cement in bulk may be made by arrangement between the purchaser and the supplier (manufacturer or stockist).

NOTE — A single bag or container containing 1 000 kg or more net mass of cement shall be considered as bulk supply of cement. Supplies of cement may also be made in intermediate containers, for example, drums of 200 kg, by agreement between the purchaser and the manufacturer.

ANNEX A

(Clause 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	Title	IS No.	Title
269 : 1989	Specification for 33 grade ordinary Portland cement (<i>fourth revision</i>)	11652 : 1986	Specification for high density polyethylene (HDPE) woven sacks for packing cement
650 : 1966	Specification for standard sand for testing of cement (<i>first revision</i>)	11653 : 1986	Specification for polypropylene (PP) woven sacks for packing cement
2580 : 1982	Specification for jute sacking bags for packing cement (<i>second revision</i>)	11761 : 1986	Specification for multi-wall paper sacks for cement valved-sewn gusseted type
3535 : 1986	Methods of sampling hydraulic cements (<i>first revision</i>)	12089 : 1987	Specification for granulated slag for the manufacture of Portland slag cement
4031 (Part 1 to 13) : 1988	Methods of Physical tests for hydraulic cement (<i>first revision</i>)	12154 : 1987	Specification for light weight jute bags for packing cement
4845 : 1968	Definitions and terminology relating to hydraulic cement	12174 : 1987	Specification for jute synthetic union bag for packing cement.
4905 : 1968	Methods of random sampling		

ANNEX B

(Clause 6.6)

HYDROPHOBICITY TEST**B-1 QUANTITATIVE TEST**

B-1.1 Take 5 g each of fresh and free flowing 33 grade ordinary Portland cement and the hydrophobic cement under test and spread each of the samples evenly in a thin layer in 15 cm (dia) petri dish. Expose it to a relative humidity of not less than 99.9 percent at $27 \pm 2^\circ\text{C}$ for 24 hours. Determine the mass loss at 550°C for the two samples. Hydrophobic cement shall not

show loss on ignition more than 30 percent of the value for the 33 grade ordinary Portland cement.

B-2 QUALITATIVE TEST (FLOATATION)

B-2.1 Sprinkle a small quantity of hydrophobic cement on water in a container. The cement shall float on the water for a period of not less than 24 hours.

ANNEX C

(Clause 9.2)

TOLERANCE REQUIREMENTS FOR THE MASS OF CEMENT PACKED IN BAGS

C-1 The net mass of cement packed in bags at the plant in a sample shall be equal to or more than 50 kg. The number of bags in a sample shall be as given below:

Batch Size	Sample Size
100 to 150	20
151 to 280	32
281 to 500	50
501 to 1 200	80
1 201 to 3 200	125
3 201 and over	200

The bags in a sample shall be selected at random (see IS 4905 : 1968).

C-1.1 The number of bags in a sample showing a minus error greater than 2 percent of the

specified net mass (50 kg) shall be not more than 5 percent of the bags in the sample. Also the minus error in none of such bags in the sample shall exceed 4 percent of the specified net mass of cement in the bag.

NOTE — The matter given in **C-1** and **C-1.1** are extracts based on the Standards of Weights and Measures (Packaged Commodities) Rules, 1977 to which reference shall be made for full details. Any modification made in these Rules and other related Acts and Rules would apply automatically.

C-1.2 In case of a wagon/truck load up to 25 tonnes, the overall tolerance on net mass of cement shall be 0 to + 0.5 percent.

NOTE — The mass of a jute sacking bag conforming to IS 2580 : 1982 to hold 50 kg of cement is 531 g, the mass of a double hessian bituminized (CRI type) bag to hold 50 kg of cement is 630 g, the mass of a 6 ply paper bag to hold 50 kg of cement is approximately 400 g and the mass of a polyethylene lined (CRI type) jute bag to hold 50 kg of cement is approximately 480 g.

ANNEX D

(Foreword)

COMPOSITION OF THE TECHNICAL COMMITTEE

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