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DEFINITIONS AND TERMINOLOGY  
RELATING TO HYDRAULIC CEMENT

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BUREAU OF INDIAN STANDARDS  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

Gr 2

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# Indian Standard

## DEFINITIONS AND TERMINOLOGY RELATING TO HYDRAULIC CEMENT

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# *Indian Standard*

## DEFINITIONS AND TERMINOLOGY RELATING TO HYDRAULIC CEMENT

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 18 September 1968, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** Hydraulic cement, more commonly known as cement, is one of the most extensively used basic materials in all civil engineering constructions. Tremendous progress in the civil engineering industry and the exacting demands of engineers for high quality building materials have resulted in the development of a large variety of hydraulic cements, both for specialized and general use in civil engineering constructions. There are a number of technical terms connected with the production and use of different type of hydraulic cements, which quite often require clarifications to give precise meaning to the stipulations in the standard specifications and other technical documents. This standard has been prepared with the object of defining various terms relating to hydraulic cements.

**0.3** 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.

**0.4** This standard is one of a series of Indian Standards on cements. Other standards published in the series are the following:

\*IS : 269-1967 Ordinary, rapid-hardening and low heat portland cement (*second revision*)

\*IS : 455-1967 Portland blastfurnace slag cement (*second revision*)

\*IS : 1489-1967 Portland-pozzolana cement (*first revision*)

IS : 650-1966 Standard sand for testing of cement (*first revision*)

IS : 4031-1968 Methods of physical tests for hydraulic cement

IS : 4032-1968 Methods of chemical analysis of hydraulic cement

**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.

\*Since revised.

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

## 1. SCOPE

**1.1** This standard lays down the general definitions applicable to hydraulic cements, as well as the particular definitions and the denominations which pertain to each type of cement.

## 2. GENERAL DEFINITIONS

**2.1 Hydraulic Cement** — Finely ground material which on addition of requisite quantity of water is capable of hardening both under water and in air by the chemical interaction of its constituents with water, and is also capable of bending together appropriate materials.

### 2.2 Component Materials

**2.2.1 Principal Component Materials** — The principal materials used in the manufacture of hydraulic cement should have either hydraulic or pozzolanic properties.

**2.2.1.1 Hydraulic properties** — Hydraulic properties are the ability of a material to set and harden in the presence of water, with formation of stable compounds.

**2.2.1.2 Pozzolanic properties** — The ability of a material to combine chemically with calcium hydroxide in the presence of water under ambient temperature forming compounds having cementitious properties.

**2.2.2 Portland Clinker** — Clinker, consisting mostly of calcium silicates, obtained by heating to incipient fusion a predetermined and homogeneous mixture of materials principally containing lime ( $\text{CaO}$ ) and silica ( $\text{SiO}_2$ ) with a smaller proportion of alumina ( $\text{Al}_2\text{O}_3$ ) and iron oxide ( $\text{Fe}_2\text{O}_3$ ).

**2.2.3 Granulated Blastfurnace Slag** — Blastfurnace slag in granulated form is used for the manufacture of hydraulic cement. Blastfurnace slag is non-metallic product consisting essentially of glass containing silicates and aluminosilicates of lime and other bases, which is developed simultaneously with iron in blastfurnace or electric pig iron furnace. Granulated slag is obtained by further processing the molten slag by rapidly chilling or quenching it with water or steam and air.

**2.2.4 High Alumina Clinker** — Clinker consisting mainly of mono calcium aluminates and obtained by complete or partial fusion of a predetermined mixture of materials mainly containing alumina ( $\text{Al}_2\text{O}_3$ ) and lime ( $\text{CaO}$ ) with smaller proportions of iron oxides, silica ( $\text{SiO}_2$ ) and other oxides.

**2.2.5 Pozzolana** — An essentially silicious material which while in itself possessing little or no cementitious properties will, in finely divided form and in the presence of water, react with calcium hydroxide at ambient temperature to form compounds possessing cementitious properties. The



term includes natural volcanic material having pozzolanic properties as also other natural and artificial materials, such as diatomaceous earth, calcined clay and fly ash.

## PORTLAND CEMENT

**3.1 Portland Cement** — Portland cement is the cement obtained by grinding Portland clinker with the possible addition of a small quantity of gypsum, water or both, and not more than one percent of air entraining agents or other agents which have proved not to be harmful ( *see* IS : 269-1967\* ).

**3.2 Additives** — In the manufacture of Portland cement, any material, other than water or gypsum, or both, which is interground with the clinker, in an amount not to exceed one percent. The following two types of additives are recognized:

- a) Processing additives designed primarily to aid the cement manufacturer in grinding or otherwise processing or handling his cement, and
- b) Functional additives added primarily to modify the end properties of cement.

**3.2.1** The additives should be covered by a statement of their nature completing the standard denomination of the cement.

**3.3 Standard Denomination Portland Cements** — Ordinary Portland cement, rapid hardening Portland cement and low-heat Portland cement.

## 4. CEMENT CONTAINING BLASTFURNACE SLAG

**4.1 Portland Blastfurnace Slag Cement** — An intimately interground mixture of Portland clinker and granulated blastfurnace slag with addition of gypsum and permitted additives ( *see* 3.2 ) or an intimate and uniform blend of Portland cement and finely ground granulated blastfurnace slag ( *see* IS : 455-1967† ).

**4.1.1 Standard Denomination** — Portland blastfurnace slag cement. The abbreviation 'PBFS Cement' shall be used for 'Portland blastfurnace slag cement'.

## 4.2 Cements Composed Mainly of Blastfurnace Slag and Calcium Sulphate

**4.2.1 Supersulphated Cement** — A hydraulic cement having sulphuric anhydride ( $\text{SO}_3$ ) content not more than 5 percent and made by

\*Specification for ordinary, rapid-hardening and low heat Portland cement ( *second revision* ). ( Since revised ).

†Specification for Portland blastfurnace slag cement ( *second revision* ). ( Since revised )

intergrinding a mixture of at least 70 percent granulated blastfurnace slag, calcium sulphate and a small amount of lime or Portland clinker.

**4.2.2 Standard Denomination** — Supersulphated cement.

## **5. HIGH ALUMINA CEMENT**

**5.1 High Alumina Cement** — High alumina cement is the cement obtained by grinding high alumina clinker.

**5.2 Standard Denomination** — High alumina cement.

## **6. CEMENTS CONTAINING POZZOLANA**

**6.1 Cements containing pozzolana** are cements obtained by intergrinding Portland clinker, gypsum and pozzolana or by intimate and uniform blending of Portland cement and fine pozzolana.

**6.2 Portland-Pozzolana Cement** — An intimately interground mixture of Portland clinker and pozzolana with the possible addition of gypsum or an intimate and uniform blend of Portland cement and fine pozzolana, the pozzolana constituent being within limits specified in IS : 1489-1967\*.

**6.2.1 Standard Denomination** — Portland-pozzolana cement.

## **7. MASONRY CEMENT**

**7.1 Masonry Cement** — Product obtained by intergrinding a mixture of Portland cement clinker with inert materials (non-pozzolanic), such as limestone, conglomerates, dolomite limestone and dolomite; and gypsum and an air entraining plasticiser, in suitable proportions so that the resulting product conforms to the requirements laid down in IS : 3466-1967†.

It is characterized by certain physical properties, such as slow-hardening, high workability and high water retentivity which make it especially suitable for masonry work.

**7.2 Standard Denomination** — Masonry cement.

## **8. OIL-WELL CEMENT**

**8.1 Hydraulic cement** suitable for use in high pressure and temperature in sealing water and gas pockets and setting casings during the drilling and repair of oil-wells, often contains retarders to meet the requirements of such use in addition to coarser grinding and/or reduced tricalcium aluminate ( $C_3A$ ) content of clinker.

\*Specification for Portland-pozzolana cement (first revision). (Since revised).

†Specification for masonry cement.

## 9. SULPHATE-RESISTANT CEMENT

**9.1 Sulphate-Resistant Portland Cement** — Portland cement with its tricalcium aluminate ( $C_3A$ ) content [calculated by the formula  $C_3A = 2.65 (Al_2O_3) - 1.69 (Fe_2O_3)$ ] not more than 5 percent and specific surface determined by Blaines air permeability method not less than  $2500 \text{ cm}^2/\text{g}$ .

## 10. HYDROPHOBIC CEMENT

**10.1 Hydrophobic Cement** — Cement obtained by grinding 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.

(Continued from page 2)

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