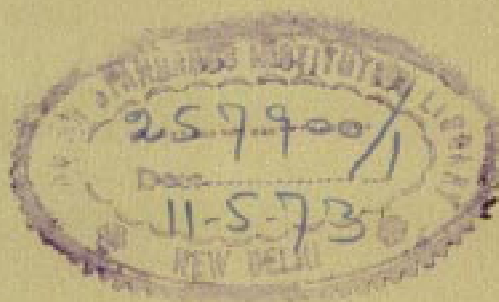


# *Indian Standard*

## GLOSSARY OF TERMS RELATING TO CEMENT CONCRETE PART X TESTS AND TESTING APPARATUS

UDC 001.4 : 666.972 : 620.1



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# Indian Standard

## GLOSSARY OF TERMS RELATING TO CEMENT CONCRETE

### PART X TESTS AND TESTING APPARATUS

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( Continued on page 12 )

# *Indian Standard*

## GLOSSARY OF TERMS RELATING TO CEMENT CONCRETE

### PART X TESTS AND TESTING APPARATUS

#### 0. FOREWORD

**0.1** This Indian Standard ( Part X ) was adopted by the Indian Standards Institution on 16 February 1973, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

**0.2** Cement concrete is one of the most versatile and extensively used building materials in all civil engineering constructions. There are a number of technical terms connected with the basic materials for concrete as well as the production and use of concrete which quite often require clarification to give precise meaning to the stipulations in the standard specifications, codes of practices and other technical documents. It has, therefore, become necessary to standardize the various terms and definitions used in cement and concrete technology and thus avoid ambiguity in their interpretations. The Sectional Committee has, therefore, decided to bring out a series of glossaries of terms relating to concrete and concrete materials.

**0.3** For convenience of reference, this glossary of terms relating to cement concrete has been grouped into the following twelve parts:

Part I Concrete aggregates

Part II Materials ( other than cement and aggregate )

Part III Concrete reinforcement

Part IV Types of concrete

Part V Formwork for concrete

Part VI Equipment, tools and plant

Part VII Mixing, laying compaction, curing and other construction aspects

Part VIII Properties of concrete

Part IX Structural aspects

Part X Tests and testing apparatus

Part XI Prestressed concrete

Part XII Miscellaneous

**0.3.1** In addition to those given in **0.3**, two separate standards have been brought out concerning terminology relating to hydraulic cement and pozzolanic materials. These standards are IS : 4845-1968\* and IS : 4305-1967†.

**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. This has been met by deriving assistance from the following publications:

BS 2787 : 1956 Glossary of terms for concrete and reinforced concrete  
British Standards Institution.

BS 4340 : 1968 Glossary of formwork of terms. British Standards  
Institution.

ASTM Designation : C 125 Definitions of terms relating to concrete  
aggregate. American Society for Testing and Materials.

ACI SP-19 Cement and concrete terminology. American Concrete  
Institute.

ACI 617-1968 Recommended practice for concrete formwork.  
American Concrete Institute.

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## **1. SCOPE**

**1.1** This standard ( Part X ) covers definitions of terms relating to tests and testing apparatus for cement concrete.

## **2. DEFINITIONS**

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Absorbed Moisture** — Moisture that has entered a solid material by absorption and has physical properties not substantially different from ordinary water at the same temperature and pressure.

**2.2 Accidental Air** — Air voids in concrete which are not purposely entrained.

**2.3 Adsorbed Water** — Water held on surfaces of a material by electro-chemical forces and having physical properties substantially different from those of absorbed water or chemically combined water at the same temperature and pressure.

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\*Definitions and terminology relating to hydraulic cement.

†Glossary of terms relating to pozzolana.

**2.4 Adsorption** — Development at the surface of a liquid or solid of a higher concentration of a substance than exist in the bulk of the medium; especially formation of one or more layers of molecules of gases, of dissolved substances, or of liquids at the surface of a solid, such as cement, cement paste, or aggregate, or of air-entraining agents at the air-water interfaces; also the process by which a substance is adsorbed.

**2.5 Air Content** — The volume of air voids in cement paste, mortar, or concrete, exclusive of pore space in aggregate particles, usually expressed as a percentage of total volume of the paste, mortar, or concrete.

**2.6 Air Meter** — A device for measuring the air content of concrete and mortar.

**2.7 Air Permeability Test** — A procedure for measuring the fineness of powdered materials, such as portland cement.

**2.8 Air Void** — A space in cement paste, mortar, or concrete filled with air; an entrapped air void is characteristically 1 mm or more in size and irregular in shape; an entrained air void is typically between 10 and 1 000 mm microns in diameter and spherical or nearly so.

**2.9 Ball Test** — A test to determine the consistency of freshly mixed concrete by measuring the depth of penetration of a cylindrical metal weight with a hemispherical bottom.

**2.10 Beam Test** — A method of measuring the flexural strength ( modulus of rupture ) of concrete by testing a standard unreinforced beam.

**2.11 Blaine Apparatus** — Air-permeability apparatus for measuring the surface area of a finely ground cement, raw material, or other product.

**2.12 Blaine Fineness** — The fineness of powdered materials, such as cement and pozzolana, expressed as surface area usually in square centimeters per gram, determined by the Blaine apparatus.

**2.13 Blaine Test** — A method for determining the fineness of cement or other fine material on the basis of the permeability to air of a sample prepared under specified conditions.

**2.14 Briquette** — A moulded specimen of mortar with enlarged extremities and reduced centre having a cross section of definite area, used for measurement of tensile strength.

**2.15 Calorimeter** — An instrument for measuring heat exchange during a chemical reaction, such as the quantities of heat liberated by the combustion of a fuel or hydration of a cement.

**2.16 Cap** — A smooth, plane surface of suitable material bonded to the bearing surfaces of test specimens to insure uniform distribution of load during strength testing.

**2.17 Colorimetric Value** — An indication of the amount of organic impurities present in fine aggregate.

**2.18 Compacting Factor** — The ratio obtained by dividing the observed weight of concrete which fills a container of standard size and shape when allowed to fall into it under standard conditions of test, by the weight of fully compacted concrete which fills the same container.

**2.19 Compression Test** — Test made on a test specimen of mortar or concrete to determine the compressive strength.

**2.20 Consistency** — The relative mobility or ability of freshly mixed concrete or mortar to flow; the usual measurements are slump for concrete and flow for mortar, cement paste, or grout.

**2.21 Consistency Factor** — A measure of grout fluidity roughly analogous to viscosity, which described the ease with which grout may be pumped into pores or fissures; usually a laboratory measurement in which consistency is reported in degrees of rotation of a torque viscosimeter in a specimen of grout.

**2.22 Consistometer** — An apparatus for measuring the consistency of cement paste, mortar, grout, or concrete.

**2.23 Cored Beam** — A beam whose cross section is partially hollow, or a beam from which cored samples of concrete have been taken.

**2.24 Coring** — The act of obtaining cores from concrete structures or rock foundations.

**2.25 Cube Strength** — The load per unit area at which a standard cube fails when tests in a specified manner.

**2.26 Decant** — To pour off a liquid without disturbing a sediment or precipitate.

**2.27 Diametral Compression Test** — See 2.71.

**2.28 Differential Thermal Analysis (DTA)** — Indication of thermal reaction by differential thermocouple recording of temperature changes in a sample under investigation compared with those of a thermally passive control sample, that is heated uniformly and simultaneously.

**2.29 Dry-Volume Measurement** — Measurement of the ingredients of grout, mortar, or concrete by their bulk volume.

**2.30 Dunagan Analysis** — A method of separating the ingredients of freshly mixed concrete or mortar to determine the proportions of the mixture.

**2.31 False Set** — The rapid development of rigidity in a freshly mixed Portland cement paste, mortar, or concrete without the evolution of much

heat, which rigidity can be dispelled and plasticity regained by further mixing without addition of water; premature stiffening, hesitation set, early stiffening, and rubber set are terms referring to the same phenomenon, but false set is the preferred designation.

**2.32 Field-Cured Cylinders** — Test cylinders cured as nearly as practicable in the same manner as the concrete in the structure to indicate when supporting forms may be removed, additional construction loads may be imposed or the structure may be placed in service.

**2.33 Final Set** — A degree of stiffening of a mixture of cement and water greater than initial set, generally stated as an empirical value indicating the time in hours and minutes required for a cement paste to stiffen sufficiently to resist to an established degree, the penetration of a weighted test needle; also applicable to concrete and mortar mixtures with use of suitable test procedures.

**2.34 Final Setting Time** — The time required for a freshly mixed cement paste, mortar, or concrete to achieve final set.

**2.35 Flame Photometer** — An instrument used to determine elements (especially sodium and potassium in Portland cement) by the colour intensity of their unique flame spectra resulting from introducing a solution of a compound of the element into a flame (also known as flame spectrophotometer).

**2.36 Flash Set** — The rapid development of rigidity in a freshly mixed Portland cement paste, mortar, or concrete, usually with the evolution of considerable heat, which rigidity cannot be dispelled, nor can the plasticity be regained by further mixing without addition of water; also referred to as quick set or grab set.

### **2.37 Flow:**

- a) Time dependent irrecoverable deformation; and
- b) A measure of the consistency of freshly mixed concrete, mortar, or cement paste in terms of the increase in diameter of a moulded truncated cone specimen after jiggling a specified number of times.

**2.38 Flow Cone** — A device for measurement of grout consistency in which a predetermined volume of grout is permitted to escape through a precisely sized orifice, the time of efflux (flow factor) being used as the indication of consistency; also, the mold used to prepare a specimen for the flow test.

**2.39 Flow Table** — A jiggling device used in making flow tests for consistency of cement paste, mortar, or concrete.

**2.40 Gillmore Needle** — A device used in determining time of setting of hydraulic cement.



**2.41 Infrared Spectroscopy** — The use of a spectrophotometer for determination of infrared absorption spectra (2.5 to 18-micron wave lengths) of materials, used for detection, determination, and identification especially of organic materials.

**2.42 Initial Set** — A degree of stiffening of a mixture of cement and water less than final set, generally stated as an empirical value indicating the time in hours and minutes required for cement paste to stiffen sufficiently to resist to an established degree, the penetration of a weighted test needle; also applicable to concrete or mortar with use of suitable test procedures.

**2.43 Initial Setting Time** — The time required for a freshly mixed cement paste, mortar or concrete to achieve initial set.

**2.44 Kelly Ball** — An apparatus used for indicating the consistency of fresh concrete, consisting of a cylinder with a hemispherically shaped bottom and handle and a stirrup to guide the handle and serve as a reference for measuring depth of penetration (see 2.9).

**2.45 Kelly Ball Test** — See 2.9 and 2.44.

**2.46 Liquid-Volume Measurement** — Measurement of grout on the basis of the total volume of solid and liquid constituents.

**2.47 Loss on Ignition** — The percentage loss in weight of a sample of cement mortar or concrete ignited to constant weight at a specified temperature, usually 900 to 1 000°C.

**2.48 Moist Room** — A room in which the atmosphere is maintained at a selected temperature (usually  $23.0 \pm 1.7^{\circ}\text{C}$  or  $73.4 \pm 3.0^{\circ}\text{F}$ ) and a relative humidity of at least 98 percent, for the purpose of curing and storing cementitious test specimens.

**2.49 Mould:**

- a) A device containing a cavity into which neat cement, mortar, or concrete test specimens are cast; and
- b) A form used in the fabrication of precast mortar or concrete units.

**2.50 Neat Cement Paste** — A mixture of hydraulic cement and water, both before and after setting and hardening.

**2.51 Normal Consistency:**

- a) The degrees of wetness exhibited by a freshly mixed concrete, mortar, or neat cement grout when the workability of the mixture is considered acceptable for the purpose at hand; and

- b) The physical condition of neat cement paste, within a specified time after completion of mixing, as determined with the Vicat apparatus in accordance with the method specified in IS : 4031-1968\*.

**2.52 Owendry** — The condition resulting from having been dried to essentially constant weight, in an oven the temperature of which has been previously fixed, usually between 105 and 110°C; also the process of producing this condition.

**2.53 Penetration Resistance** — The resistance, usually expressed in kg/mm<sup>2</sup> of mortar or cement paste to penetration by a plunger or needle under standardized conditions.

**2.54 Permanent Set** — Inelastic elongation or shortening.

**2.55 Permeability to Water, Co-efficient of** — The rate of discharge of water under laminar flow conditions through a unit cross-sectional area of a porous medium under a unit hydraulic gradient and standard temperature conditions usually 27°C.

**2.56 Photometer** — See 2.35.

**2.57 Polarizing Microscope** — A microscope equipped with elements permitting observations and determinations to be made using polarized light.

**2.58 Proving Ring** — A device for calibrating load indicators of testing machines, consisting of a calibrated elastic ring and a mechanism or device for indicating the magnitude of deformation under load.

**2.59 Puddling:**

- a) Process of inducing compaction in mortar or concrete by use of a tamping rod, and
- b) Undesirable placement of shotcrete wherein air pressure is decreased and water content is increased.

**2.60 Relative Humidity** — The ratio of the quantity of water vapour actually present to amount present in a saturated atmosphere at a given temperature; expressed as a percentage.

**2.61 Remoulding Test** — A test to measure remouldability.

**2.62 Schmidt Hammer ( Trade Name )** — A device for the non-destructive testing of hardened concrete based on the principle that the rebound of a steel hammer, after impact against the concrete, is proportional to the compressive strength of the concrete.

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\*Methods of physical tests for hydraulic cement.

**2.63 Screen ( or Sieve )** — A metallic plate or sheet, a woven wire cloth, or other similar device, with regularly spaced apertures of uniform size, mounted in a suitable frame or holder for use in separating material according to size; in mechanical analysis an apparatus with square openings is a sieve.

**2.64 Screen Analysis** — *See* 2.66.

**2.65 Sieve** — *See* 2.63.

**2.66 Sieve Analysis** — Determination of the proportions of particles lying within certain size ranges in a granular material by separation on sieves of different size openings.

**2.67 Sieve Correction** — Correction of a sieve analysis to adjust for deviation of sieve performance from that of standard calibrated sieves.

**2.68 Slump Cone** — A mould in the form of a truncated cone with a base diameter of 20 cm, top diameter 10 cm, and height 30 cm, used to fabricate a specimen of freshly mixed concrete for the slump test.

**2.69 Slump Test** — The procedure for measuring slump.

**2.70 Spectrophotometer** — Instrument for measuring intensity of radiant energy of desired frequencies absorbed by atoms or molecules; substances are analyzed by converting the absorbed energy to electrical signals, proportional to the intensity of radiation.

**2.71 Splitting Tensile Test ( Diametral Compression Test )** — A test for tensile strength in which a cylindrical specimen is loaded to failure in diametral compression.

**2.72 Standard Curing** — Exposure of test specimens to specified conditions of moisture or humidity and of temperature.

**2.73 Test** — A decisive trial, such as a controlled loading to failure of a specimen or a specified number of similar specimens.

**2.74 Testing Machine** — A device for applying test conditions and accurately measuring results.

**2.75 Torque Viscosimeter** — A viscosimeter used for measuring consistency of slurries in which rotation of a device suspended in a rotating cup is the measure of viscosity.

**2.76 Turbidimeter** — A device for measuring the particle size distribution of a finely divided material by taking successive measurements of the turbidity of a suspension in a fluid.

**2.77 Turbidimeter Fineness** — The fineness of a material, such as Portland cement, usually expressed as total surface area in square centimetres per gram, as determined with the turbidimeter.

**2.78 Vee-bee Apparatus** — A device for the measurement of the consistency of freshly mixed concrete; the measure of consistency is the time of vibration in seconds; required to transform the concrete sample from a truncated cone (remaining after removal of the slump cone) into a right cylinder; the time is assumed directly proportional to the energy used in compacting the sample.

**2.79 Vicat Apparatus** — A penetration device used in the testing of hydraulic cements and similar materials.

**2.80 Vicat Needle** — A weighed needle for determining setting time of hydraulic cements.

**2.81 Viscometer** — Instrument for determining viscosity of slurries including fresh concrete.

**2.82 Wagner Fineness** — The fineness of materials, such as Portland cement expressed as total surface area in square centimeters per gram, determined by the Wagner turbidimeter apparatus and procedure.

**2.83 Wet Screening** — Screening to remove from fresh concrete all aggregate particles larger than a certain size.

**2.84 Wet Sieving** — *See* 2.83.

(Continued from page 2)

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IS:

- 383-1970 Coarse and fine aggregates from natural sources for concrete ( *second revision* )
- 456-1964 Code of practice for plain and reinforced concrete ( *second revision* )
- 457-1957 Code of practice for general construction of plain and reinforced concrete for dams and other massive structures
- 516-1968 Methods of test for strength of concrete
- 1199-1959 Methods of sampling and analysis of concrete
- 1343-1959 Code of practice for prestressed concrete
- 2386 ( Parts I to VIII )-1963 Methods of test for aggregates for concrete
- 2770 ( Part I )-1967 Methods of testing bond in reinforced concrete: Part I Pull-out test
- 3085-1965 Method of test for permeability of cement mortar and concrete
- 3370 ( Part I )-1965 Code of practice for concrete structures for the storage of liquids: Part I General requirements
- 3370 ( Part II )-1965 Code of practice for concrete structures for the storage of liquids: Part II Reinforced concrete
- 3370 ( Part III )-1965 Code of practice for concrete structures for the storage of liquids: Part III Prestressed concrete structures
- 3370 ( Part IV )-1967 Code of practice for concrete structures for the storage of liquids: Part IV Design tables

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