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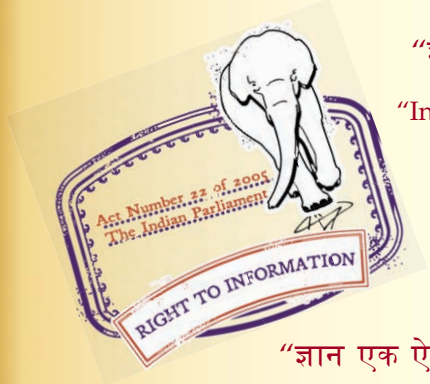

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GLOSSARY OF TERMS RELATING TO CEMENT CONCRETE

PART VIII PROPERTIES OF CONCRETE

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GLOSSARY OF TERMS RELATING TO CEMENT CONCRETE

PART VIII PROPERTIES CONCRETE

0. FOREWORD

0.1 This Indian Standard (Part VIII) 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 the above, 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 standard 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 No. SP-19-1967 Cement and concrete terminology. American Concrete Institute.

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

1. SCOPE

1.1 This standard (Part VIII) covers definitions of terms relating to properties of concrete.

2. DEFINITIONS

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

2.1 Absorption — The process by which a liquid is drawn into and tends to fill permeable pores in a porous solid body; also the increase in weight of a porous solid body resulting from the penetration of a liquid into its permeable pores.

2.2 Acceleration — Increase in velocity or in rate of change, especially the quickening of the natural progress of a process, such as hardening, setting, or strength development of concrete.

2.3 Accidental Air — *See* **2.34.**

2.4 Agglomeration — Gathering into a ball or mass.

*Definitions and terminology relating to hydraulic cement.
†Glossary of terms relating to pozzolana.

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 Entraining — The capability of a material or process to develop a system of minute bubbles of air in cement paste, mortar, or concrete (*see also* **2.7**).

2.7 Air Entrainment — The occulation of air in the form of minute bubbles (generally smaller than 1 mm) during the mixing of concrete or mortar (*see also* **2.6**).

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.

2.9 Alkali-Aggregate Reaction — Chemical reaction in mortar, or concrete between alkalis (sodium and potassium) from portland cement or other sources and certain constituents of some aggregates; under certain conditions, deleterious expansion of the concrete or mortar may result.

2.10 Autogenous Healing — A natural process of closing and filling of cracks in concrete or mortar when the concrete or mortar is kept damp.

2.11 Autogenous Volume Change — Change in volume produced by continued hydration of cement exclusive of effects of external forces or change of the water content or temperature.

2.12 Bleed — To undergo bleeding (*see also* **2.13**).

2.13 Bleeding — The autogenous flow of mixing water within, or its emergence from newly placed concrete or mortar; caused by the settlement of the solid materials within the mass or drainage of mixing water; also called water gain.

2.14 Bleeding Capacity — The ratio of volume of water released by bleeding to the volume of paste or mortar.

2.15 Bleeding Rate — The rate at which water is released from a paste or mortar by bleeding.

2.16 Bulk Density — The weight of a material (including solid particles and any contained water) per unit volume including voids.

2.17 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 compacted concrete compacted by a standard procedure of rodding (*see* IS : 1199-1959*) which fills the same container.

*Methods of sampling and analysis of concrete.

2.18 Compressive Strength — The measured maximum resistance of a concrete or mortar specimen to axial loading; expressed as force per unit cross-sectional area.

2.19 Concrete, Dense — Concrete containing a minimum of voids.

2.20 Concrete Fat — A concrete containing a large proportion of mortar.

2.21 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.

2.22 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.

2.23 Contraction (or Expansion), of Concrete — The sum of volume changes occurring as the result of all processes affecting the bulk volume of a mass of concrete (*see also* **2.66**).

2.24 Creep — Time-dependent deformation due to load.

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

2.26 Cylinder Strength — *See* **2.18**.

2.27 Drying Shrinkage — Contraction caused by moisture loss.

2.28 Durability — The ability of concrete to resist weathering action, chemical attack, abrasion, and other conditions of service.

2.29 Early Strength — Strength of concrete or mortar developed soon after placement usually during the first 72 hours.

2.30 Effective Modulus of Elasticity — Combination of elastic and plastic effects in an over-all stress-strain relationship in the service structure; often expressed as:

$$E_{eff} = \frac{1}{1 + 0{\cdot}4\ (EC/E_f)} . EC$$

where

EC = modulus of elasticity of concrete, and

E_f = modulus of elasticity of the foundation rock.

2.31 Elasticity — That property of a material by virtue of which it tends to recover immediately its original size and shape after the load which causes the deformation is removed.

2.32 Elastic Modulus — The ratio of normal stress corresponding to strain for tensile or compressive stresses below the proportional limit of material; also referred to as 'modulus of elasticity', 'Youngs modulus' and 'Young's modulus of elasticity'; denoted by the symbol E.

2.33 Entrained Air — Microscopic air bubbles intentionally incorporated in mortar or concrete during mixing.

2.34 Entrapped Air — Air voids in concrete which are not purposely entrained.

2.35 Expansion of Concrete — *See* **2.23.**

2.36 False Set — The rapid development of rigidity in a freshly mixed portland cement paste, mortar, or concrete without the evolution of much heat; this rigidity can be dispelled and plasticity regained by further mixing without addition of water (also known as premature stiffening, hesitation set, early stiffening and rubber set).

2.37 Fatigue — The weakening of a material caused by repeated or alternating loads.

2.38 Fatigue Strength — The greatest stress which can be sustained for a given number of stress cycles without failure.

2.39 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 (*see also* **2.46**).

2.40 Final Setting Time — The time required for a freshly mixed cement paste, mortar, or concrete to achieve final set (*see also* **2.47**).

2.41 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 rigidily cannot be dispelled nor can the plastic plasticity be regained by further mixing without addition of water; also referred to as quick set or grab set.

2.42 Flat Slab — A concrete slab reinforced in two or more directions, generally without beams or girders to transfer the loads to supporting members.

2.43 Flow

a) Time dependent irrecoverable deformation (*see* **2.57**); and
b) A measure of the consistency of freshly mixed concrete, mortar, or cement paste in terms of the increase in diameter of a molded truncated cone specimen after jigging a specified number of times.

2.44 Grab Set — *See* **2.41.**

2.45 Initial Drying Shrinkage — The difference between the length of a specimen (moulded and cured under stated conditions) and its length when first dried to constant length, expressed as a percentage of the moist length.

2.46 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 and 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 (*see also* **2.39**).

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

2.48 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 900-1 000°C.

2.49 Mechanical Bond — The physical keying of one plaster coat to another, or to the plaster base by plaster keys to metal lath, or by interlock between adjacent plaster coats by scratching or cross-raking; also between concrete and reinforcing bars, the bond attributed to keying or interlocking action other than adhesion.

2.50 Moisture Movement

a) The process by which moisture moves through a porous medium; and

b) The effects of such movement on the dimensions of a material such as concrete, mortar, cement paste, or rock (*see also* **2.27**).

2.51 Permeability to Water, Coefficient 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 20°C.

2.52 Plaster Set — *See* **2.36.**

2.53 Porosity — The ratio, usually expressed as a percentage, of the volume of voids in a material to the total volume of the material, including the voids.

2.54 Premature Stiffening — *See* **2.36.**

2.55 Pressed Edge — Edge of a footing along with the greatest soil pressure occurs under conditions of over turning.

2.56 Quick Set — *See* **2.36.**

2.57 Remouldability — The readiness with which freshly mixed concrete responds to a remoulding effort such as jigging or vibration causing it to reshape its mass around reinforcement and to conform to the shape of the form (*see* **2.43**).

2.58 Retardation — Reduction in the rate of hardening or setting, that is, an increase in the time required to reach initial and final set or to develop early strength of fresh concrete, mortar, or grout.

2.59 Rheology — The science dealing with flow of materials, including studies of deformation of hardened concrete, the handling and placing of freshly mixed concrete, and the behaviour of slurries, pastes, and the like.

2.60 Rich Concrete — Concrete of high cement content.

2.61 Rodability — The susceptibility of fresh concrete or mortar to compaction by means of a tamping rod.

2.62 Rubber Set — *See* **2.41.**

2.63 Set — The condition reached by a cement paste, mortar, or concrete when it has lost plasticity to an arbitrary degree, usually measured in terms of resistance to penetration or deformation; initial set refers to first stiffening; final set refers to attainment of significant rigidity.

2.64 Setting Shrinkage — A reduction in volume of concrete prior to the final set of cement, caused by settling of the solids and by the decrease in volume due to the chemical combination of water with cement.

2.65 Setting Time — *See* **2.40** and **2.47.**

2.66 Shrinkage — Volume decrease caused by drying and chemical changes; a function of time but not of temperature or of stress due to external load (*see also* **2.23** *and* **2.27**).

2.67 Slump — A measure of consistency of freshly mixed concrete mortar, or stucco equal to the subsidence measured to the nearest 6 mm of the molded truncated cone immediately after removal of the slump cone.

2.68 Specific Heat — The amount of heat required per unit mass to cause a unit rise of temperature, over a small range of temperature; for ordinary concrete and steel it is approximately 0·22 and 0·12 Btu/lb/deg F (cal/g/deg C), respectively.

2.69 Splitting Tensile Strength — Tensile strength of concrete determined by a splitting tensile test.

2.70 Strength, Compressive — *See* **2.18.**

2.71 Strength, Creep — The stress that causes a given creep in a given time and at a specified temperature.

2.72 Strength, Fatigue — *See* **2.38.**

2.73 Strength, Shear — The maximum shearing stress which a material is capable of developing, based on the original area of cross section.

2.74 Strength Tensile — Maximum stress which a material is capable of resisting under axial tensile loading, based on the cross-sectional area of the specimen before loading.

2.75 Strength Ultimate — The maximum resistance to load that a member of structure is capable of developing before failure occurs; or, with reference to cross sections of members, the largest moment, axial force or shear, a structural concrete cross section will support.

2.76 Strength Yield — The stress, less than the maximum attainable stress, at which the ratio of stress to strain has dropped well below its value at the low stress, or at which a material exhibits a specified limiting deviation from the usual proportionality of stress to strain.

2.77 Swelling — Volume increase caused by wetting or chemical changes, or both, a function of time but not of stress due to external load.

2.78 Temperature Cracking — Cracking due to tensile failure, caused by temperature drop in members subjected to external restraints or temperature differential in members subjected to internal restraints.

2.79 Toughness — The property of matter which resists fracture by impact or shock.

2.80 Transverse Strength — A property of a solid that indicates its ability to withstand bending.

2.81 Turbidimeter Fineness — The fineness of material, such as portland cement, usually expressed as total surface area in square centimeters per gram, as determined with the turbidimeter (*see also* **2.84**).

2.82 Void-Cement Ratio — Volumetric ratio of air plus water to cement.

2.83 Volume Change — An increase or decrease in volume.

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

2.85 Water Gain — *See* **2.13.**

2.86 Wettest Stable Consistency — The condition of maximum water content at which cement grout or mortar will adhere to a vertical surface without sloughing.

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