भारतीय मानक **IS 6461 (Part 8) : 2024**

Indian Standard

सीमेंट कंक्रीट — पारिभाषिक शब्दावली

भाग 8 कंक्रीट के गुण

(पहला पुनरीक्षण)

Cement Concrete — Glossary of Terms

Part 8 Properties of Concrete

(First Revision)

ICS 01.040.91

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Cement and Concrete Sectional Committee, CED 02

FOREWORD

This Indian Standard (Part 8) (First 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.

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 standards. Based on this necessity and to standardize the various terms and definitions used in cement and concrete technology, this standard was published in 12 parts.

The other parts in the series are:

Part 1 Concrete aggregates

Part 2 Materials (other than cement and aggregate)

Part 3 Concrete reinforcement

Part 4 Types of concrete

Part 5 Formwork for concrete

Part 6 Equipment, tools and plant

Part 7 Mixing, laying, compaction, curing and other construction aspects

Part 9 Structural aspects

Part 10 Tests and testing apparatus

Part 11 Prestressed concrete

Part 12 Miscellaneous terms

In addition to the above, the terminology relating to hydraulic cement and pozzolanic materials are separately covered in IS 4845 and IS 4305.

This standard was first published in 1973. In this revision the necessary changes required have been incorporated in the light of experience gained in its use and also to bring it in line with the latest development on the subject. The significant modifications made in this revision include definitions of characteristic strength, flexural strength, workability, grade of concrete, etc.

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 6100-9 : 2007 ‘Building and civil engineering — Vocabulary — Part 9: Work with concrete and plaster’, British Standards Institution

ASTM C125 : 2021 ‘Standard terminology relating to concrete and concrete aggregates’, American Society for Testing and Materials (Revision 21A)

ACI CT-23 : 2023 ‘Concrete terminology’, American Concrete Institute

ACI 617 : 1968 ‘Recommended practice for concrete formwork’, American Concrete Institute

(*Continued on third cover*)

Indian Standard

CEMENT CONCRETE — GLOSSARY OF TERMS

PART 8 PROPERTIES OF CONCRETE

(First Revision)

1 SCOPE

This standard (Part 8) covers definitions of terms relating to properties of concrete.

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 agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards:

IS No.	*Title*
IS 516 (Part 1/ Sec 1) : 2021	Hardened concrete — Methods of test: Part 1 Testing of strength of hardened concrete, Section 1 Compressive, flexural and split tensile strength (*first revision*)
IS 1199 : 1959	Methods of sampling and analysis of concrete
IS 4305 : 1967	Glossary of terms relating to pozzolana
IS 4845 : 1968	Definitions and terminology relating to hydraulic cement

3 TERMINOLOGY

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

3.1 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.

3.2 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.

3.3 Accidental Air — *See* 3.38.

3.4 Agglomeration — Gathering into a ball or mass.

3.5 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.

3.6 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* 3.7).

3.7 Air Entrainment — The occultation of air in the form of minute bubbles (generally smaller than 1 mm) during the mixing of concrete or mortar (*see* 3.6).

3.8 Air Void — A space in cement paste, mortar, or concrete filled with air; an entrapped air void is characteristically 1 mm or more.

3.9 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.

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

3.11 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.

3.12 Average Bond Stress — Maximum force in an embedded reinforcing bar divided by the product of the perimeter and the length of the reinforcing bar.

3.13 Bleed — To undergo bleeding (*see* 3.14).

3.14 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.

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

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

3.17 Bond Strength — Bond stress at the instant before failure of concrete bond.

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

3.19 Characteristic Strength — Strength of material below which not more than 5 percent of the test results are expected to fall.

3.20 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) which fills the same container.

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

3.22 Concrete, Dense — Concrete containing a minimum number of voids.

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

3.24 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.

3.25 Consistency Factor — A measure of out 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 viscometer in a specimen of grout.

3.26 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* 3.76).

3.27 Core Strength — Compressive strength of a concrete assessed from a core sample. Compressive strength of concrete made with a specific concrete mix using a specified cuboid specimen.

3.28 Creep — Time-dependent deformation due to load.

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

3.30 Cylinder Strength — *See* 3.21.

3.31 Drying Shrinkage — Contraction caused by moisture loss.

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

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

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

$$E_{\text{eff}} = \frac{1}{1 + 0.4(E_{\text{c}}/E_{\text{f}})} E_{\text{c}}$$

where

E_{c} = modulus of elasticity of concrete; and

E_{f} = modulus of elasticity of the foundation rock.

3.35 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.

3.36 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*.

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

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

3.39 Expansion of Concrete — *See* 3.26.

3.40 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).

3.41 Fatigue — The weakening of a material caused by repeated, cyclic or alternating loads.

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

3.43 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* 3.53).

3.44 Final Setting Time — The time required for a freshly mixed cement paste, mortar, or concrete to achieve final set (*see* 3.54).

3.45 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 rigidly 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.

3.46 Flat Slab — Reinforced concrete slab without beams or with nominal beams, but with or without drops, which is supported by columns with or without flared column heads or capitals.

3.47 Flexural Strength — Strength of concrete as determined by the flexural test as per IS 516 (Part 1/Sec 1).

3.48 Flow

a) Time dependent irrecoverable deformation (*see* 3.66); 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.

3.49 Grab Set — *See* 3.45.

3.50 Grade of Concrete — An identifying number, which is numerically equal to the characteristic compressive strength at 28 days expressed in MPa.

3.51 Honeycombing — Interconnected voids in concrete caused by loss or lack of mortar.

3.52 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.

3.53 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* 3.43).

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

3.55 Initial Stress — Stress imposed in the concrete or steel of a prestress concrete structural member when it is first fully stressed and before creep or plastics yield occurs.

3.56 Local Bond Stress — Bond stress at a particular point on reinforcement.

3.57 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 °C to 1 000 °C.

3.58 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.

3.59 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* 3.31).

3.60 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.

3.61 Plaster Set — *See* 3.40.

3.62 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.

3.63 Premature Stiffening — *See* 3.40.

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

3.65 Quick Set — *See* 3.40.

3.66 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* 3.48).

3.67 Restrained Shrinkage — Contraction of hardened concrete or mortar caused by evaporation of water from its mass.

3.68 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.

3.69 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.

3.70 Rich Concrete — Concrete of high cement content.

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

3.72 Rubber Set — *See* 3.45.

3.73 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.

3.74 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.

3.75 Setting Time — *See* 3.44 and 3.54.

3.76 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* 3.26 and 3.31).

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

3.78 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.

3.79 Splitting Tensile Strength — Tensile strength of concrete determined by a splitting tensile test as per IS 516 (Part 1/Sec 1).

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

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

3.82 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.

3.83 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.

3.84 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.

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

3.86 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.

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

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

3.89 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* 3.92).

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

3.91 Volume Change — An increase or decrease in volume.

3.92 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.

3.93 Water Gain — *See* 3.14.

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

3.95 Workability — That property of freshly mixed concrete or mortar that determines the ease with which it can be mixed, placed, consolidated, and finished to a homogenous condition.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Cement and Concrete Sectional Committee, CED 02

Organization	*Representative(s)*
In Personal Capacity (*Grace Villa, Kadamankulam PO, Thiruvalla - 689583*)	SHRI JOSE KURIAN **(*Chairperson*)**
ACC Ltd, Mumbai	SHRI MANOJ JINDAL DR MANISH V. KARANDIKAR (*Alternate*)
Ambuja Cements Limited, Ahmedabad	SHRI UMESH P. SONI SHRI SUKURU RAMARAO (*Alternate*)
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SCIENTIST 'D'/JOINT DIRECTOR

AND

SHRI JITENDRA KUMAR CHAUDHARY
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Composition of Concrete Sub-Committee, CED 2 : 2

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Cement Manufacturers Association, Noida	SHRI K. JAYASANKAR SHRI UTTAM KUMAR SINGH (*Alternate* I) SHRI SHUBHO CHAKRAVARTY (*Alternate* II)
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(*Continued from second cover*)

The composition of the Committee responsible for 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 periodically removed to create more space for the future falling blocks.

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