भारतीय मानक

Indian Standard

IS 6461 (Part 3) : 2024

सीमेंट कंक्रीट — पारिभाषिक शब्दावली

भाग 3 कंक्रीट सुदृढीकरण

(पहला पुनरीक्षण)

Cement Concrete — Glossary of Terms

Part 3 Concrete Reinforcement

(First Revision)

ICS 01.040.91

भारतीय मानक ब्यूरो
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Cement and Concrete Sectional Committee, CED 02

FOREWORD

This Indian Standard (Part 3) (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 documents. 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 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 8 Properties of concrete

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 1972. 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:

a) Definition of wires and strands which are used in prestressed concrete; and

b) Reinforcement couplers.

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 3 CONCRETE REINFORCEMENT

(First Revision)

1 SCOPE

This standard (Part 3) covers definitions of terms relating to concrete reinforcement.

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 1786 : 2008	High strength deformed steel bars and wires for concrete reinforcement — Specification (*fourth revision*)
IS 2770 (Part 1) : 1967	Methods of testing bond in reinforced concrete: Part 1 Pull-out test
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 Auxiliary Reinforcement — In a prestressed member, any reinforcement in addition to the reinforcements participating in the prestressing function.

3.2 Average Bond Stress — The force in a bar divided by the product of its perimeter and its embedded length.

3.3 Axle Steel — Steel from carbon-steel axles for railway carriage or automobiles.

3.4 Axle Steel Reinforcement — Plain or deformed reinforcing bars rolled from axle steel.

3.5 Band — Small bars or wire encircling the main reinforcement in a member to form a peripheral tie.

3.6 Band Iron — Thin metal strap used as form tie, hanger, etc.

3.7 Bar — A metal member used to reinforce concrete.

3.8 Bar Bender — A tradesman who cuts and bends steel reinforcement; or a machine for bending reinforcement.

3.9 Bar Chair — A rigid device used to support and/or hold reinforcing bars in proper position to prevent displacement before or during concreting.

3.10 Bar, Deformed — A reinforcing bar with manufactured surface deformations which provide a locking anchorage with surrounding concrete.

NOTE — IS 1786 define the deformed bar as a bar of steel provided with lugs, ribs or deformations on the surface of the bar to minimize the slippage of the bar in concrete, and for which the bond strength calculated from the load at a measured slip of 0.025 mm in accordance with IS 2770 (Part 1) exceeds that of a plain round bar of the same nominal size by 40 percent or more.

3.10.1 *Nominal Size of Deformed Bar* — The nominal size of a deformed bar is equivalent to the diameter or side of a plain bar having the same weight per metre run as the deformed bar.

3.11 Bar Hook — End of a reinforcing bar bent through 180 degree to form an anchorage.

3.12 Bar Mat — An assembly of steel reinforcement composed of two or more layers of bars placed at angles to each other and secured together by welding or ties.

3.13 Bar Support — *See* 3.9.

3.14 Bars, Bundled — A group of not more than four parallel reinforcing bars in contact with each other, usually tied together.

3.15 Batch — Any quantity of bars/wires of same size and strength grade and processed from an identical heat or cast, whether in coils or bundles presented for examination and test at one time.

3.16 Bending Schedule — A list of reinforcement prepared by the designer or detailer of a reinforced concrete structure showing the shapes and dimensions of every bar and the number of bars required.

3.17 Bent Bar — Longitudinal reinforcement bent to pass from one face to the other of a member, to use steel efficiently for resistance of moment and diagonal tension, or for anchorage of the bar.

3.18 Billet Steel — Steel, either reduced directly from ingots or continuously cast, made from properly identified heats of open-hearth, basic oxygen, or electric furnace steel, or lots of acids Bessemer steel and conforming to specified limits on chemical composition.

3.19 Binding Wire — Wire used for tying reinforcing bars when fixing reinforcement.

3.20 Bond — Adhesion and grip of concrete or mortar to reinforcement or to other surfaces against which it is placed, including friction due to shrinkage and longitudinal shear in the concrete engaged by the bar deformations; the adhesion of cement paste to aggregate; adherence between plaster coats or between plaster and a substrate produced by adhesive or cohesive properties of plaster or supplemental materials; also in United Kingdom the arrangement of units in masonry and brickwork so that vertical joints are discontinuous.

3.21 Bond Length — The length of grip of a reinforcing bar.

3.22 Bond Strength — Resistance to separation of mortar and concrete from reinforcing steel and other materials with which it is in contact; a collective expression for all forces such as adhesion, friction due to shrinkage, and longitudinal shear in the concrete engaged by the bar deformations that resist separation.

3.23 Bond Stress — The force of adhesion per unit area of contact between two bonded surfaces, such as concrete and reinforcing steel or any other material, such as foundation rock; shear stress at the surface of reinforcing bar, preventing relative movement between the bar and the surrounding concrete.

3.24 Bundle — Two or more coils or a number of lengths properly bound together.

3.25 Bundled Bars — A group of parallel reinforcing bars (not exceeding four) in contact with each other and enclosed in stirrups or ties and used as a reinforcing element.

3.26 Cage — A rigid assembly of reinforcement ready for placing in position.

3.27 Chair — *See* **3.9**.

3.28 Coil — One continuous length of wire in the form of a coil.

3.29 Cold Drawn Wire — Wire that is cold drawn from steel to increase its tensile strength.

3.30 Cold Twisted Deformed Bar — A bar of steel produced by cold twisting a hot rolled bar and which has lugs, ribs or deformations on its surface in accordance with definitions for deformed bars in **3.10**.

3.31 Compression Reinforcement — Reinforcement designed to carry compressive stresses.

3.32 Contact Splice — A means of connecting reinforcing bars in which the bars are lapped and are in direct contact.

3.33 Corrosion — Disintegration or deterioration of concrete or reinforcement by electrolysis or by chemical attack.

3.34 Corner Reinforcement — Plaster reinforcement used at re-entrant or internal angles to provide continuity between two intersecting plaster planes; also reinforcement provided in reinforced concrete slab for torsion at unrestrained corners.

3.35 Coupler

a) A device for connecting reinforcing bars or prestressing tendons end to end, also known as end connector or lock splice; and

b) A device for locking together the component parts of a tubular metal scaffold (also known as a clamp).

3.36 Cover Block — Device which maintains reinforcement bars in proper position and at proper distance from each other and from the forms before and during concreting; or a device which keeps wall forms at a given distance apart before and during concreting.

3.37 Crack-Control Reinforcement — Reinforcement in concrete construction designed to prevent opening of cracks, but often effective in limiting them to uniformly distributed small cracks.

3.38 Crimped Wire — Wire which is deformed into a curve which approximates a sine curve as a means of increasing the capacity of the wire to bond to the concrete; also welded wire fabric crimped to provide an integral chair.

3.39 Deformed Bar — *See* 3.10.

3.40 Deformed Tie Bar — Deformed bar used to hold two slab elements in close contact.

3.41 Deformed Wire — Wire with surface characteristics to increase bond strength.

3.42 Diamond Mesh — *See* 3.48.

3.43 Edge-Bar Reinforcement — Tension steel sometimes used to strengthen otherwise inadequate edges in a slab, without resorting to edge thickening.

3.44 Effective Area of Reinforcement — The area obtained by multiplying the normal cross-sectional area of reinforcement by the cosine of the angle between the direction of the reinforcement and the direction in which the effectiveness is required.

3.45 Effective Area of Reinforcement in Diagonal Bends — The area obtained by multiplying the normal cross-sectional area of the reinforcement by the cosine of the angle at which the band is inclined to the direction for which its effectiveness is considered.

3.46 Effective Reinforcement — Reinforcement of a section assumed to be active in resisting the applied stresses.

3.47 Elastic Limit — The limit of stress beyond which the strain is not wholly recoverable.

3.48 Expanded Metal — A metal network, often used as reinforcement in concrete construction, formed by suitably stamping or cutting sheet metal and stretching it to form open meshes, usually of diamond shape.

3.49 Field Bending — Bending of reinforcing bars on the job rather than in a fabricating shop.

3.50 Hairpin — A light hairpin shaped reinforcing bar used for shear reinforcement in beams, tie reinforcement in columns, or prefabricated column shear heads.

3.51 Hard Drawn Wire — Wire that has been drawn through die at normal temperature.

3.52 Heavy-edge Reinforcement — Wire fabric reinforcement, for highway pavement slabs, having one to four edge wires heavier than the other longitudinal wires.

3.53 High Bond Bar — *See* 3.10.

3.54 High Strength Steel — Steel with a high yield point; in the case of reinforcing bars generally greater than 42 kgf/mm^2.

3.55 High Tensile Steel — Alloy steel having a tensile strength of not less than 980 N/mm^2.

3.56 Hook — A bend in the end of a reinforcing bar.

3.57 Hooked Bar — A reinforcing bar with the end bent into a hook to provide anchorage.

3.58 Indented Wire — Deformed wire that has indentations.

3.59 Lap — The length by which one bar or sheet of fabric reinforcement overlaps another.

3.60 Lapping — The overlapping of reinforcing steel bars, welded wire fabric, or expanded metal so that there may be continuity of tensile or compressive stress in the reinforcing bar when the concrete member is subjected to flexural or tensile or compressive loading.

3.61 Lap Splice — A connection of reinforcing steel made by lapping the ends of the bars.

3.62 Lateral Reinforcement — Usually applied to the transverse hoops, links, or helical reinforcement in columns.

3.63 Load Transfer Assembly — Most commonly, the unit (basket or plate) designed to support or link dowel bars during concreting operations so as to hold them in place, in the desired alignment.

3.64 Longitudinal Bar — Reinforcement essentially parallel to the long axis of a concrete member or pavement.

3.65 Longitudinal Reinforcement — *See* 3.64.

3.66 Main Bar — Steel reinforcement designed to resist stresses resulting from design loads and moments, as opposed to reinforcement intended to resist secondary stresses. Also, this is reinforcement that distributes main structural forces.

3.67 Main Reinforcement — *See* 3.66.

3.68 Mat — *See* 3.12.

3.69 Mechanical Bond — The bond between concrete and reinforcing bars, attributed to keying or interlocking action other than adhesion.

3.70 Mesh — A series of longitudinal and transverse wires arranged substantially at right angles to each other and welded together at all points of intersection.

3.71 Mesh Reinforcement — Welded-wire fabric in either sheets or rolls, used to reinforce concrete.

3.72 Mill Scale — The oxide layer formed during the hot rolling of metals, such as that formed on hot-rolled reinforcing bars.

3.73 Negative Reinforcement — Steel reinforcement for negative moment.

3.74 Non-prestressed Reinforcement — Ordinary or high tensile strength reinforcing steel, as used in prestressed concrete construction, and subjected to no prestressing nor post-tensioning.

3.75 Offset Bend — Any bend in a reinforcing bar that displaces the centre line of a section of the bar to a position parallel to the original bar, in which the displacement is relatively small; commonly applied to column verticals.

3.76 Pencil Rod — Plain metal rod of about 6 mm diametre.

3.77 Plain Bar — A reinforcing bar without surface deformations, or one having-deformations that do not conform to the applicable requirements.

3.78 Positive Reinforcement — Reinforcement for positive moment.

3.79 Proof Stress — The stress 'which is just' sufficient to produce, under load, a non-proportional elongation equal to a specified percentage of the original gauge length; conventionally the specified percentage is fixed at 0.1 percent or 0.2 percent. IS 1786 specifies this limit as 0.2 percent.

3.80 Rail Steel Reinforcement — Reinforcing bars hot-rolled from standard T-section rails.

3.81 Reinforcement — Metal bars, wires, or other slender members which are embedded as percentage of concrete in such a manner that the metal and the concrete act together in resisting forces.

3.82 Reinforcement Chair — Device to support the top layer of reinforcement for a concrete slab.

3.83 Reinforcement, Cold-Drawn Wire — Steel wire made from rods that have been hot rolled from billets, cold-drawn through a die; for concrete reinforcement of small diameter, such as in sizes not less than 2 mm nor greater than 16 mm.

3.84 Reinforcement, Cold-Worked Steel — Steel bars or wires which have been rolled, twisted, or drawn at normal ambient temperatures.

3.85 Reinforcement, Corner — Metal reinforcement for plaster reentrant corners to provide continuity between two intersecting planes; or concrete reinforcement used at wall intersections or near corners of square or rectangular openings in walls, slabs, or beams.

3.86 Reinforcement Coupler — Coupling sleeve or threaded coupler for mechanical splices of reinforcement bars for the purpose of providing transfer of axial tensile force and/or compressive force from one bar to the other, where:

a) coupling sleeve is a device fitting over the ends of two reinforcing bars; and

b) threaded coupler is a threaded device for joining reinforcing bars with matching threads.

3.87 Reinforcement, Crack-Control — Reinforcement concrete construction designed to minimize opening of cracks, often effective in limiting them to uniformly distributed small cracks.

3.88 Reinforcement Displacement — Movement of reinforcing steel from its specified position in the forms.

3.89 Reinforcement, Distribution Bar — Small-diameter bars, usually at right angles to the main reinforcement, intended to spread a concentrated load on a slab and to prevent cracking.

3.90 Reinforcement, Dowel-Bar — Short bars, extending approximately equally into two abutting pieces of concrete, to increase the strength of the joint.

3.91 Reinforcement, Expanded Metal Fabric — A form of reinforcement made by slitting a rolled steel sheet and then stretching it to form a diamond-shaped mesh.

3.92 Reinforcement, Four-Way — A system of reinforcement in flat slab construction comprising bands of bars parallel to two adjacent edges and also to both diagonals of a rectangular slab.

3.93 Reinforcement, Helical — Steel reinforcement forming a helix.

3.94 Reinforcement, High Tensile — Concrete reinforcing bars having a minimum yield strength or 0.2 percent proof stress above a specified value, such as 42 kgf/mm^2 or 52 kgf/mm^2.

3.95 Reinforcement, Hoop — Binders in the form of rings (other than helical) round the main reinforcement in columns and piles.

3.96 Reinforcement, Lateral — Usually applied to the transverse hoops, links, or helical reinforcement in columns.

3.97 Reinforcement, Mesh — An arrangement of bars or wire normally in two directions at right angles, tied or welded at the intersections, or interwoven (*see also* 3.92).

3.98 Reinforcement Ratio — Ratio of the effective area of the reinforcement to the effective area of the concrete at any section of a structural member.

3.99 Reinforcement, Secondary — Reinforcement other than main reinforcement.

3.100 Reinforcement, Spiral — Coiled wire or bar held to a definite pitch or spacing.

3.101 Reinforcement, Transverse

a) Links or helical reinforcement for columns; and

b) Reinforcement at right angles to the main reinforcement.

3.102 Reinforcement, Twin-Twisted Bar — Two bars of the same nominal diameter twisted together.

3.103 Reinforcement, Two-Way — Reinforcement arranged in bands of bars at right angles to each other.

3.104 Reinforcement, Welded — Reinforcement joined together by welding.

3.105 Relaxation (of Steel) — Decrease in stress in steel as a result of creep within the steel under prolonged strain; decrease in stress in steel as a result of decreased strain of the steel, such as results from shrinkage and creep of the concrete in a prestressed concrete unit.

3.106 Seven-Wire Strand — Any length of finished material which comprises six wires spun together in helical form around a central wire.

3.107 Shear Reinforcement — Reinforcement designed to resist shear or diagonal tension stresses; dowels are not considered to be shear reinforcement.

3.108 Shrinkage Reinforcement — Reinforcement designed to resist shrinkage stresses in concrete.

3.109 Slab Spacer — Bar support and spacer for slab reinforcement.

3.110 Spacer — Device which maintains reinforcement in proper position, or wall forms at a given distance apart before and during concreting.

3.111 Spiral Reinforcement — *See* 3.100.

3.112 Splice — Connection of one reinforcing bar to another by overlapping, welding, mechanical end connectors, or other means.

3.113 Standard Hook — A hook at the end of a reinforcing bar made in accordance with a standard.

3.114 Stirrup — A reinforcing device to resist shear and diagonal tension stresses in a beam, typically a steel bar bent into a U-shape and installed perpendicular to or at an angle to the longitudinal reinforcement, and properly anchored.

3.115 Strand — A prestressing tendon composed of a number of wires most of which are twisted about a centre wire or core.

3.116 Stress Corrosion — Corrosion of a metal accelerated by stress.

3.117 Temperature Reinforcement — Reinforcement designed to carry stresses resulting from temperature changes; also the minimum reinforcement for areas of members which are not subjected to primary stresses or necessarily to temperature stresses.

3.118 Tensile Strengths — The maximum load reached in a tensile test divided by the original cross-sectional area of the gauge length portion of the test piece. Also termed as maximum stress, or ultimate tensile stress.

3.119 Tension Reinforcement — Reinforcement designed to carry tensile stresses such as those in the bottom of a simple supported beam.

3.120 Three-Wire Strand — Any length of finished material which comprises three wires spun together in helical form.

3.121 Tie — Closed loop of reinforcing bars encircling the longitudinal steel in columns; also a tensile unit which holds concrete formwork secure against lateral pressure of unhardened concrete.

3.122 Tie Bar — A deformed bar embedded in a concrete construction at a joint and designed to hold abutting edges together, but not designed for direct load transfer as a dowel.

3.123 Transverse Reinforcement — Reinforcement at right angles to the principal axis of a member.

3.124 Twin-Twisted Reinforcement — *See* 3.102.

3.125 Two Way Reinforcement — Reinforcement for a concrete slab consisting of bands or reinforcing bars at right angles to each other.

3.126 Two-Wire Strand — Any length of finished material which comprises two wires spun together in helical form.

3.127 Web Bar — Reinforcement placed in a concrete member to resist shear and diagonal tension.

3.128 Web Reinforcement — *See* 3.127.

3.129 Welded-Butt Splice — A reinforcing bar splice made by welding the butted ends.

3.130 Welded-Wire Fabric — A series of longitudinal and transverse wires arranged substantially at right angles to each other and welded together at all points of intersection.

3.131 Welded-Wire Fabric Reinforcement — Welded-wire fabric in either sheets or rolls, used to reinforce concrete.

3.132 Wire, Cold-Drawn — Wire made from the rods hot rolled from billets and then cold-drawn through dies.

3.133 Wire Mesh — *See* 3.130.

3.134 Woven-Wire Fabric — A prefabricated steel reinforcement composed of cold-drawn steel wires mechanically twisted together to form hexagonally shaped openings.

3.135 Woven-Wire Reinforcement — *See* 3.130.

3.136 Yield Point — That point during increasing stress when the proportion of stress to strain becomes substantially less than it has been at smaller values of stress.

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

3.138 Yield Stress — Stress (that is, load per unit cross-sectional area) at which elongation first occurs in the test-piece without increasing the load during tensile test. In the case of steels with no such definite yield point, the yield stress is the stress under the prescribed testing conditions at which the observed increase in the gauge length is 1/200 of the gauge length when the rate at which the load is applied is not more than 0.5 kg/mm^2/s when approaching the yield stress.

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*)
Cement Manufacturers Association, Noida	DR V. RAMACHANDRA SHRI PRAKHAR SRIVASTAVA (*Alternate* I) SHRI SHUBHO CHAKRAVARTY (*Alternate* II)
Central Public Works Department, New Delhi	SHRI DINESH KUMAR UJJAINIA
Central Soil and Materials Research Station, New Delhi	SHRI U. S. VIDYARTHI SHRI B. K. MUNZNI (*Alternate*)
CSIR - Central Building Research Institute, Roorkee	DR S. K. SINGH SHRI SUBHASH CHAND BOSE GURRAM (*Alternate*)
CSIR - Structural Engineering Research Centre, Chennai	DR K. RAMANJANEYULU DR P. SRINIVASAN (*Alternate*)
Engineers India Limited, New Delhi	DR SUDIP PAUL SHRI VIKRAM K. GUPTA (*Alternate* I) SHRI RAKESH KUMAR (*Alternate* II) SHRI RAVI GERA (*Alternate* III)
Hindustan Construction Company Ltd, Mumbai	SHRI KHATAR BATCHA SHRI PRAVEEN H. SHETTIGAR (*Alternate*)
Hindustan Consulting Associates Pvt Ltd, New Delhi	SHRI SATISH KUMAR SHARMA
Housing and Urban Development Corporation Limited, New Delhi	SHRI DEEPAK BANSAL
Indian Association of Structural Engineers, New Delhi	PROF MAHESH TANDON SHRI MANOJ K. MITTAL (*Alternate*)
Indian Concrete Institute, Chennai	DR M. R. KALGAL PROF S. SARASWATI (*Alternate*)
Indian Institute of Technology Delhi, New Delhi	DR SHASHANK BISHNOI DR DIPTI RANJAN SAHOO (*Alternate*)
Indian Institute of Technology Madras, Chennai	DR MANU SANTHANAM
Indian Institute of Technology Roorkee, Roorkee	DR UMESH KUMAR SHARMA SHRI PRAMOD KUMAR GUPTA (*Alternate* I) PROF ANJANEYA DIXIT (*Alternate* II)
National Council for Cement and Building Materials, Ballabhgarh	SHRI P. N. OJHA DR S. K. CHATURVEDI (*Alternate* I) SHRI BRIJESH SINGH (*Alternate* II)
National Test House, Kolkata	SHRI D. V. S. PRASAD DR SOMIT NEOGI (*Alternate*)

Organization	*Representative(s)*
Nuvoco Vistas Corporation Ltd, Mumbai	DR PRANAV DESAI SHRI JAI SINGH (*Alternate*)
The India Cements Limited, Chennai	SHRI S. DAKSHINAMOORTHY SHRI P. MUNI REDDY (*Alternate*)
The Indian Hume Pipe Company Limited, Mumbai	SHRI P. R. BHAT SHRI S. J. SHAH (*Alternate*)
The Institution of Engineers (India), Kolkata	DR H. C. VISVESVARAYA SHRI S. H. JAIN (*Alternate*)
The Ramco Cements Limited, Chennai	SHRI BALAJI K. MOORTHY SHRI ANIL KUMAR PILLAI (*Alternate*)
Ultra Tech Cement Ltd, Mumbai	SHRI RAJU GOYAL SHRI K. JAYASANKAR (*Alternate*)
Voluntary Organization in Interest of Consumer Education, New Delhi	SHRI M. A. U. KHAN DR RAJIV JHA (*Alternate*)
In Personal Capacity (*House No. 131 Sector 11D Faridabad - 121006*)	SHRI V. V. ARORA
In Personal Capacity [*B-806, Oberoi Exquisite, Oberoi Garden City, Goregaon (East), Mumbai - 400063*]	SHRI A. K. JAIN
In Personal Capacity (*36, Old Sneh Nagar, Wardha Road, Nagpur - 440015*)	SHRI L. K. JAIN
BIS Directorate General	SHRI DWAIPAYAN BHADRA, SCIENTIST 'E'/DIRECTOR AND HEAD (CIVIL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretaries
SHRIMATI DIVYA S.
SCIENTIST 'D'/JOINT DIRECTOR

AND

SHRI JITENDRA KUMAR CHAUDHARY
SCIENTIST 'B'/ASSISTANT DIRECTOR
(CIVIL ENGINEERING), BIS

Composition of Concrete Sub-Committee, CED 2 : 2

Organization	*Representation(s)*
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ACC Limited, Mumbai	SHRI SANJAY ROY SHRI RAKESH GUPTA (*Alternate*)
Ambuja Cement, Mumbai	SHRI UMESH P. SONI SHRI SUKURU RAMARAO (*Alternate*)
Association of Consulting Civil Engineers India, Bengaluru	SHRI AVINASH D. SHIRODE SHRI K. K. MEGHASHYAM (*Alternate*)
Cement Manufacturers Association, Noida	SHRI K. JAYASANKAR SHRI UTTAM KUMAR SINGH (*Alternate* I) SHRI SHUBHO CHAKRAVARTY (*Alternate* II)
Central Public Works Department, New Delhi	SHRI DINESH KUMAR UJJAINIA
Central Soil and Materials Research Station, New Delhi	SHRI U. S. VIDYARTHI SHRI M. RAJA (*Alternate*)
Creative Design Consultants and Engineers Private Limited, Ghaziabad	SHRI AMAN DEEP SHRI MANIK CHATTERJEE (*Alternate*)
CSIR - Central Building Research Institute, Roorkee	DR R. SIVA CHIDAMBARAM DR H. C. ARORA (*Alternate* I) SHRI RAJESH KUMAR (*Alternate* II)
CSIR - Central Road Research Institute, New Delhi	SHRI SATISH PANDEY
CSIR - Structural Engineering Research Centre, Chennai	DR B. H. BHARAT KUMAR DR M. B. ANOOP (*Alternate*)
Elkem South Asia Private Limited, Navi Mumbai	SHRI BRAJESH MALVIYA SHRI SURENDRA SHARMA (*Alternate*)
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Hindustan Consulting Associates Private Limited, New Delhi	SHRI SATISH KUMAR SHARMA
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Indian Institute of Technology Hyderabad, Hyderabad	PROF K. V. L. SUBRAMANIAM
Indian Institute of Technology Madras, Chennai	DR MANU SANTHANAM PROF RADHAKRISHNA G. PILLAI (*Alternate*)
Indian Society of Structural Engineers, Mumbai	SHRI UMESH JOSHI SHIR HEMANT S. VADALKAR (*Alternate*)
L&T Construction, Chennai	DR K. SIVAKUMAR SHRI S. MANOHAR (*Alternate*)

Organization	*Representation(s)*
National Council for Cement and Building Materials, Ballabgarh	SHRI P. N. OJHA SHRI BRIJESH SINGH (*Alternate* I) SHRI PUNEET KAURA (*Alternate* II)
RDC Concrete Private Limited, Mumbai	SHRI ANIL BANCHHOR SHRI SIMRANJIT SINGH (*Alternate*)
Ready Mixed Concrete Manufacturers' Association, Mumbai	SHRI RAMESH JOSHI
Tandon Consultants Private Limited, New Delhi	PROF MAHESH TANDON SHRI VINAY GUPTA (*Alternate*)
Tata Consulting Engineers Limited, Navi Mumbai	SHRI S. N. DIWAKAR SHRI MANOS KUMAR DE (*Alternate*)
UltraTech Cement Limited, Mumbai	DR V. RAMACHANDRA DR AWADHESH K. SINGH (*Alternate*)
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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.

This Indian Standard has been developed from Doc No.: CED 02 (24628).

Amendments Issued Since Publication

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