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Indian Standard

सीमेंट कंक्रीट — पारिभाषिक शब्दावली

भाग 11 पूर्वप्रबलित कंक्रीट

(पहला पुनरीक्षण)

Cement Concrete — Glossary of Terms

Part 11 Prestressed Concrete

(First Revision)

ICS 01.040.91

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Cement and Concrete Sectional Committee, CED 02

FOREWORD

This Indian Standard (Part 11) (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 8	Properties of concrete
Part 9	Structural aspects
Part 10	Tests and testing apparatus
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 creep, creep coefficient, chemical prestressing, grouting, final and initial tension, 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 11 PRESTRESSED CONCRETE

(First Revision)

1 SCOPE

This standard (Part 11) covers definitions of terms relating to prestressed 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 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 Anchor — In prestressed concrete, to lock the stressed tendon in position so that it will retain in stressed condition; in precast concrete construction, to attach the precast units to the building frame; in slabs on grade or walls, to fasten to rock or adjacent structures to prevent movement of the slab or wall with respect to the foundation, adjacent structure, or rock.

3.2 Anchorage — In post-tensioning, a device used to anchor the tendon to the concrete member; in pretensioning, a device used to anchor the tendon during hardening of the concrete; in precast concrete construction, the devices for attaching precast units to the building frame; in slab or wall construction, the device used to anchor the slab or wall to the foundation, rock, or adjacent structure.

3.3 Anchorage Bond Stress —The bar forces divided by the product of the bar perimeter or perimeters and the embedment length.

3.4 Anchorage Deformation or Slip — The loss of elongation or stress in the tendons of prestressed concrete due to the deformation of the anchorage or slippage of the tendons in the anchorage device when the prestressing force is transferred from the jack to the anchorage device.

3.5 Anchorage Device — *See* 3.2.

3.6 Anchorage Loss — *See* 3.4.

3.7 Anchorage Zone — In post-tensioning, the region adjacent to the anchorage subjected to secondary stresses resulting from the distribution of the prestressing force; in pretensioning, the region in which the transfer bond stresses are developed.

3.8 Block Beam — A flexural member composed of individual blocks which are joined together by prestressing.

3.9 Bonded Member — A prestressed concrete member in which the tendons are bonded to the concrete either directly or through grouting.

3.10 Bonded Post-Tensioning — Post-tensioned construction in which the annular spaces around the tendons are grouted after stressing, thereby bonding the tendon to the concrete section.

3.11 Bonded Tendon — A prestressing tendon which is bonded to the concrete either directly or through grouting.

3.12 Cable — *See* 3.80.

3.13 Camber — A slight, usually upward; curvature of a truss, beam, or form to improve appearance or to compensate for anticipated deflection, such as that produced as, a normal consequence of the eccentricity from the centre of gravity of the section of the prestressing tendons.

3.14 Cap Cables — Short cables (tendons) introduced to prestressing the zone of negative bending only.

3.15 Characteristic Load — Load which has 95 percent probability of not being exceeded during the life of the structure.

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

3.17 Chemically Prestressing — Concrete made with expansive cement and reinforcement under conditions such that the expansion of the cement induces tensile stress in the reinforcement so as to produce prestressed concrete.

3.18 Column/Strut — A compression member, the effective length of which exceeds three times the least lateral dimension.

3.19 Concentric Tendons — Tendons following a line coincident with the gravity axis of the prestressed concrete member.

3.20 Concrete, Prestressed — *See* 3.63.

3.21 Creep — Time dependent deformation due to sustained load.

3.22 Creep Coefficient — The ratio of creep strain to elastic strain in concrete.

3.23 Curvature Friction — Friction resulting from bends or curves in the specified prestressing cable profile.

3.24 Dead End — In the stressing of a tendon from one end only, the end opposite that to which stress is applied.

3.25 Dead-End Anchorage — The anchorage at that end of a tendon which is opposite the jacking end.

3.26 Deflected Tendons — Tendons which have a trajectory that is curved or bent with respect to the gravity axis of the concrete member.

3.27 Development Bond Stress — *See* 3.3.

3.28 Duct — A hole formed in a concrete member to accommodate a tendon for post-tensioning; a pipe or runway for electric, telephone, or other utilities.

3.29 Eccentric Tendon — A tendon which follows a trajectory not coincident with the gravity axis of the concrete member.

3.30 Effective Prestress — The stress remaining in concrete due to prestressing after, all losses have occurred, excluding the effect of superimposed loads, but including effect of weight of member.

3.31 Elastic Shortening — In prestressed concrete, the shortening of a member which occurs immediately on the application of forces induced by prestressing.

3.32 End Anchorage — Mechanical device to transmit prestressing force to the concrete in a post-tensioned member.

3.33 End Block — An enlarged end section of a member designed to reduce anchorage stresses to allowable values.

3.34 Final Prestress — *See* 3.35.

3.35 Final Stress — In prestressed concrete, the stress which exists after substantially all losses have occurred.

3.36 Final Tension — The tension in the prestressing tendon corresponding to the state of the final prestress.

3.37 Flat Jack — A hydraulic jack consisting of light gauge metal bent and welded to a flat shape which expands under internal pressure.

3.38 Flexural Bond — In prestressed concrete, the stress between the concrete and the tendon which results from the application of external load.

3.39 Grouting — The purpose of grouting is to provide permanent protection to the post-tensioned steel against corrosion and to develop bond between the prestressing steel and the surrounding structural concrete. The grout ensures the encasement of steel in an alkaline environment for corrosion protection and by filling the duct space, it prevents water collection and freezing.

3.40 Harped Tendons — *See* 3.26.

3.41 Hoyer Effect — In prestressed concrete, frictional forces which result from the tendency of the tendons to regain the diameter which they had before they were stressed.

3.42 Indented Wire — Wire having machine-made surface indentations intended to improve bond; depending on type of wire, may be used for either concrete reinforcement or pretensioning tendons**.**

3.43 Initial Prestress —The stress or force applied to concrete at the time of stressing.

3.44 Initial Stresses — The stresses occurring in prestressed concrete members before any losses occur.

3.45 Initial Tension — The maximum stress induced in the prestressing tendon at the time of the stressing operation.

3.46 Jack — A mechanical device of varying design used to apply force to prestressing tendons, adjust elevation of forms or form supports, and raise weights by small distances.

3.48 Jacking Device — The device used to stress the tendons for prestressed concrete; also, a device for raising a vertical slipform.

3.49 Jacking Force — Temporary force exerted by the device which introduces tension into prestressing tendons.

3.50 Jacking Stress — The maximum stress occurring in a prestressed tendon during stressing.

3.51 Linear Prestressing — Prestressing as applied to linear members, such as beams and columns.

3.52 Linear Transformation — The method of altering the trajectory of the prestressing tendon in any statically indeterminate prestressed structure by changing the location of the tendon at one or more interior supports without altering its position at the end supports and without changing the basic shape of the trajectory between any supports; linear transformation does not change the location of trajectory of the pressure line.

3.53 Loss of Prestress — The reduction of the prestressing force which results from the combined effects of creep in the steel and creep and shrinkage of the concrete; does not normally include friction losses but may include. The effect of elastic deformation of the concrete.

3.54 Multielement Prestressing — Prestressing accomplished by stressing an assembly of several individual structural elements as a means of producing one integrated structural member.

3.55 Multistage Stressing — Prestressing performed in stages as the construction progresses.

3.56 Non-Concordant Tendons — In statically indeterminate structures, tendons that are not coincident with pressure line caused by the tendons.

3.57 Overstretching — Stressing of tendons to a value higher than designed for the initial stress to:

a) overcome frictional losses;

b) temporarily overstress the steel to reduce steel creep that occurs after anchorage; and

c) counteract loss of prestressing force that is caused by subsequent prestressing of other tendons.

3.58 Parallel-Wire Unit — A post-tensioning tendon composed of a number of wires or strands which are approximately parallel.

3.59 Partial Prestressing — Prestressing to a stress level such that, under design loads, tensile stresses exist in the precompressed tensile zone of the prestressed member.

3.60 Partial Release — Release into a prestressed concrete member of a portion of the total prestress initially held wholly in the prestressed reinforcement.

3.61 Post-Tensioning — A method of prestressing reinforced concrete in which tendons are tensioned after the concrete has hardened.

3.62 Pre-Post-Tensioning — A method of fabricating prestressed concrete in which some of the tendons are pretensioned and a portion of the tendons are post-tensioned.

3.63 Prestressed Concrete — Concrete in which internal stresses of such magnitude and distribution are introduced that the tensile stresses resulting from the service loads are counteracted to a desired degree; in reinforced concrete the prestress is commonly introduced by tensioning the tendons.

3.64 Pretensioning — A method of prestressing reinforced concrete in which the tendons are tensioned before concreting.

3.65 Pretensioning Bed (or Bench) — The casting bed on which pretensioned members are manufactured and which resists the pretensioning force prior to release.

3.66 Sequence-Stressing Loss — In post-tensioning, the elastic loss in a stressed tendon resulting from the shortening of the member when additional tendons are stressed.

3.67 Sheath — An enclosure in which post-tensioned tendons are encased to prevent bonding during concrete placement.

3.68 Sheathing — The material forming the contact face of forms; also called lagging or sheeting.

3.69 Sheeting — *See* **3.68**.

3.70 Shrinkage Loss — The loss of stress in the prestressing steel resulting from the shrinkage of the concrete.

3.71 Short Column — A column, the effective length of which does not exceed 12 times the least lateral dimension.

3.72 Slender Column — A column, the effective length of which exceeds 12 times the least lateral dimension.

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

3.74 Strand Grip — A device used to anchor strands.

3.75 Stress at Transfer — The stress in both the prestressing tendon and the concrete at the stage when the prestressing tendon is released from the prestressing mechanism.

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

3.77 Stressing End — In prestressed concrete, the end of the tendon from which the load is applied when tendons are stressed from one end only.

3.78 Stress Relaxation — Stress loss resulting from strain developed when a constant length is maintained under stress.

3.79 Swift — A reel or turntable on which prestressing tendons are placed to facilitate handling and placing.

3.80 Tendon — A steel element, such as a wire, cable, bar, rod, or strand used to impart prestress to concrete when the elements tensioned.

3.81 Tendon Profile — The path or trajectory of the prestressing tendon.

3.82 Threaded Anchorage — An anchorage device which is provided with threads to facilitate attaching the jacking device and to effect the anchorage.

3.83 Trajectory of Prestressing Force — The path along which the prestress is effective in a structure or member; it is coincident with the centre of gravity of the tendons for simple flexural members and statically indeterminate members which are prestressed with concordant tendons, but is not coincident with the centre of gravity of the tendons of a statically indeterminate structure which is prestressed with non-concordant tendons.

3.84 Transfer — The act of transfering the stress in prestressing tendons from the jacks or pretensioning bed to the concrete member.

3.85 Transfer Bond — In pretensioning, the bond stress resulting from the transfer of stress from the tendon to the concrete.

3.86 Transfer Length — *See* **3.88**.

3.87 Transfer Strength — The concrete strength required before stress is transferred from the stressing mechanism to the concrete.

3.88 Transmission Length — The distance at the end of a pretensioned tendon necessary for the bond stress to develop the maximum tendon stress; sometimes called transfer length.

3.89 Transverse Prestress — Prestress that is applied at right angles to the principal axis of a member.

3.90 Unbounded Member — Post-tensioned, prestressed concrete element in which tensioning force is applied against end anchorages only, tendons being free to move within the element.

3.91 Unbounded Post-Tensioning — Post-tensioning in which the tendons are not grouted after stressing.

3.92 Unbounded Tendon — A tendon which is not bonded to the concrete section.

3.93 Wedge Anchorage — A device for providing the means of anchoring a tendon by wedging.

3.94 Wobble Coefficient — A coefficient used in determining the friction loss occurring in post-tensioning, which is assumed to account for the secondary curvature of the tendons.

3.95 Wobble Friction — Friction caused by the unintended variation of the prestressing steel sheath or duct from its specified profile.

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*)
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National Test House, Kolkata	SHRI D. V. S. PRASAD DR SOMIT NEOGI (*Alternate*)

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Association of Consulting Civil Engineers India, Bengaluru	SHRI AVINASH D. SHIRODE SHRI K. K. MEGHASHYAM (*Alternate*)
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Central Public Works Department, New Delhi	SHRI DINESH KUMAR UJJAINIA
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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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