IS:6461 (Part XI)-1973
(Reaffirmed 1987)
(Reaffirmed 1997)

Indian Standard

GLOSSARY OF TERMS RELATING TO CEMENT CONCRETE

PART XI PRESTRESSED CONCRETE

(Third Reprint OCTOBER 1996)

UDC 001.4:666.982.4

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 3

March 1973

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Indian Standard

GLOSSARY OF TERMS RELATING TO CEMENT CONCRETE

PART XI PRESTRESSED CONCRETE

0. FOREWORD

0.1 This Indian Standard (Part XI) 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 pozzolanic materials and hydraulic cement. These standards are IS:4305-1967* and IS:4845-1968†.

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 : C125 Definitions of terms relating to concrete aggregate. American Society for Testing and Materials.

ACI No. SP-19 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 XI) covers definitions of terms relating to prestressed concrete.

2. DEFINITIONS

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

2.1 Anchor — In prestressed concrete, to lock the stressed tendon in position so that it will retain its 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.

2.2 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,

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

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.

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

2.4 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.

2.5 Anchorage Device — *See* **2.2**.

2.6 Anchorage Loss — *See* **2.4**.

2.7 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.

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

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

2.10 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.

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

2.12 Cable — *See* **2.67**.

2.13 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.

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

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

2.16 Concrete, Prestressed — *See* **2.53**.

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

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

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

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

2.21 Development Bond Stress — *See* **2.3.**

2.22 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.

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

2.24 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.

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

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

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

2.28 Final Prestress — *See* **2.29.**

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

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

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

2.32 Harped Tendons — *See* **2.20.**

2.33 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.

2.34 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.

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

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

2.37 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.

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

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

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

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

2.42 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.

2.43 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.

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

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

2.46 Nonconcordant Tendons — In statically indeterminate structures, tendons that are not coincident with pressure line caused by the tendons.

2.47 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.

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

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

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

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

2.52 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.

2.53 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.

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

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

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

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

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

2.59 Sheeting — *See* **2.58**.

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

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

2.62 Strand Grip — A device used to anchor strands.

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

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

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

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

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

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

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

2.70 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 fledural 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 nonconcordant tendons.

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

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

2.73 Transfer Length — *See* **2.75**.

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

2.75 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.

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

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

2.78 Unbonded Post-Tensioning — Post-tensioning in which the tendons are not grouted after stressing.

2.79 Unbonded Tendon — A tendon which is not bonded to the concrete section.

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

2.81 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.

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

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