

CONCRETE TERMINOLOGY

1.0. GENERAL

Concrete is composed of an inert matrix of sand, gravel, crushed rock, or other aggregates held together by a hardened paste of hydraulic cement and water. The thoroughly mixed ingredients, when properly proportioned, make a plastic mass which can be cast or moulded into a predetermined size and shape. Upon hydration of the cement by water, concrete becomes stonelike in strength and hardness with utility for many purposes.

Aggregates occupy about three-fourth of the space within a given mass of concrete and the rest is occupied by hydrated water-cement paste and air-voids.

The study of concrete technology as a subject requires focus on its various aspects such as the constituting materials, properties of concrete in its fresh and hardened states, principles and procedures for mix design, concreting operations and processes, approaches to quality control, etc. All these aspects are inter-related and one aspect can not be discussed independent of the others. In other words, the various aspects have to be discussed treating concrete as a system.

The aim of this chapter is to facilitate better understanding of the subject by outlining the definitions of terms frequently encountered in the subject. This terminology is based on the following Indian Standards :

- (i) IS : 6461-1972 (Part I to XII) : Glossary of Terms relating to cement concrete.
- (ii) IS : 4845-1968 : Definitions and Terminology relating to Hydraulic cement.

(iii) IS : 4305-1967 : Glossary of Terms relating to Pozzolana.

1.1. COMMON TERMS

The definitions of common terms are outlined below :

Abram's W.C. Law : According to this law "For any given conditions for test the strength of a workable concrete mix is dependent on the water cement ratio".

Accelerator : An admixture which, when added to a batch of concrete, accelerates cement hydration, thus causing to develop strength more rapidly than concrete without the accelerator and thereby reduce setting time of cement.

Admixture : A substance, other than cement, water, or aggregate, added to a batch of fresh concrete in the mixer for the purpose of altering any of the properties of the concrete such as accelerating or retarding setting time, water proofing, colouring etc. (includes pozzolanas).

Agitator : A vehicle for transporting concrete, in which premixed concrete is slowly mixed or agitated en route the job site ; specifically, it is a rotary drum mixer mounted on a motor truck.

Agirator : It is a device for maintaining plasticity and preventing segregation of mixed concrete by agitation.

Air-entrained Concrete : Concrete containing purposefully entrained air. Principal advantage is improved durability.

Air-entraining Agent : An admixture that forms numerous microscopic air bubbles or spheroids in concrete.

Alkali-aggregate Reaction : A detrimental reaction which can occur in hardened concrete between certain siliceous portions of the aggregates and the alkalis in cement.

Annular Attachment : It is a standard attachment to Vicat Apparatus for determination of final setting time of cement.

Architectural Concrete : Exposed concrete on a building, either exterior or interior, required to have an especially high-quality finish free from blemishes.

ASTM : Abbreviation for "American Society for Testing of Materials".

Autogenous Healing : Self-healing of cracks under favourable conditions of temperature, moisture, and lack of movement.

Bag : A unit of measure of cement, equal to 50 kg.

Batching Sequence : Any sequence of introducing the ingredients of concrete into the mixer.

Bleeding (Water, Gain, Sedimentation) : The appearance of free water on the surface of fresh concrete resulting from settlement of solid particles and consequent relative upward movement of water.

Blending Sand : A sand added to the normal available sand for improvement of gradation.

Blockout : An opening or cavity formed in concrete to facilitate subsequent construction of a structure. Example, a blockout in a wall for installation of a pipe. Blockouts are usually filled with concrete or mortar upon completion of construction.

Briquette : Standard testpiece for determining tensile strength of cement using a mixture of cement and standard sand in the proportion of 1 : 3 by weight.

Bug Holes : Small pits, bubbles, or voids, in the surface of formed concrete.

Bulking of Sand : It is the phenomenon of increase in the bulk volume of a quantity of sand in a moist condition over the volume of sand completely dry or fully saturated.

Cap : The act of preparing strength specimen for testing, in which a fluid or mastic material is applied to the specimen ends to be in contact with the testing machine. Hardening of the capping compound against a machined steel plate provides a smooth surface. Also, the hardened material after application to the specimen.

Capillarity : Flow of water through minute pores and voids in concrete, resulting from capillary action instituted when a constant supply of water is in contact with one surface of the concrete, and evaporation occurs on the other side.

Cavitation : Wearing away of concrete exposed to high-velocity turbulent flow of water, resulting in a rough, pockmarked surface.

Cement Content or Cement Factor : The amount of cement in 1 cu. m. of concrete, expressed either in kilogrammes or bags.

Central-mixed Concrete : Concrete that is mixed in a stationary mixer and hauled to the job site in agitators.

Centrifugal Pipe : Concrete pipe manufactured by spinning a horizontal form, the concrete being forced against the rotating form by centrifugal force.

Cleanup : The act of preparing a construction joint or rock foundation to receive concrete, in which the surface is scrubbed or sand blasted for removal of dirt, laitance, oil, and other foreign material.

Coarse Aggregate : The aggregate particles retained on a 4.75 sieve.

Cable Mix : Mass concrete containing coarse aggregate up to 150 mm in size.

Coefficient of Expansion : The rate at which concrete changes volume with changes in temperature. For concrete, the coefficient of linear expansion of concrete is $0.00001 \text{ cm}/(^{\circ}\text{C})$.

Cohesiveness : The element of workability that governs the extent of harshness or stickiness.

Cold Joint : The surface between two successive runs of concrete in which the first concrete placed has passed its final set and can no longer be blended into the second run.

Compaction Factor Test : It is a standard test to represent the workability of the mix. The test has been developed by the Road Research Laboratory (England). It is based on the amount of work required for complete compaction of the mix.

Concrete Boron Loaded : It is a higher density concrete containing boron admixture.

Concrete Aerated : It is a light weight concrete in which void or cell structure is attained with gas forming chemicals or foaming agents. It is also known as light weight or foamed concrete.

Concrete No Fines : It is a concrete which does not contain fine aggregates.

Concrete No Slump : It is a concrete having a slump of 25 mm or less.

Concrete Refractory : It is a concrete having refractory properties, usually made with calcium-aluminate cement and refractory aggregate. It is particularly suitable for use at temperature above 1000°C .

Concrete Terrazzo : It is marble aggregate concrete cast in place or precast and ground smoothly for decorative surface purposes or floors and walls.

Concrete Translucent : It is a combination of glass and concrete used in precast or prestressed panels.

Concrete Cyclopean : It is mass concrete in which large stones weighing 50 kg or more are placed and embedded in concrete as it is deposited.

Concrete Insulating : It is concrete having low thermal conductivity. It is used for thermal insulation.

Concrete Vacuum : It is concrete from which water is extracted by vacuum process before hardening occurs.

Concrete Vermiculite : It is concrete in which the aggregate consists of exfoliated vermiculite.

Concrete Wet Mix Shotcrete : It is concrete in which all ingredients including mixing water, are mixed in the equipment before introduction into the delivery hose.

Conductivity : The rate at which concrete conducts heat.

Consistency : A measure of the fluidity, softness, or wetness of fresh concrete determined by measuring the number of centimeters a specific sample slumps or subsides when a conical form is removed from the sample. The greater the number of centimeters of subsidence, the "higher" the slump, and the water or softer is the concrete.

Consolidate : To make concrete into a solid, uniform mass, without voids or rock pockets, usually accomplished by the application of vibration, occasionally by hand spading or tamping. Sometimes called "compact".

Construction Joint : A plane surface between two increments of concrete, the second increment having been placed on or against the first after the first had hardened.

Contraction : Reduction in volume of hardened concrete due to drying after wetting, or temperature reduction.

Contraction Joint : A groove formed in the fresh concrete, or sawed in hardened concrete or open joint between two dam blocks to create a plane of weakness in a slab or panel so as to cause the concrete, during drying shrinkage, to crack at the weakened plane rather than at random.

Control Chart : A chronological graph of concrete strength for control and analysis of concrete strength.

Control Joint : A contraction joint or expansion joint.

Crazing (Hair Cracking) : A pattern of fine hairlike cracks caused by the shrinkage of the surface of concrete relative to the interior.

Creep (Plastic Flow) : Deformation of concrete under a sustained load.

Cube Crushing Strength : It is one of standard method for determining the compressive strength of concrete. The test is carried out on $10 \times 10 \times 10$ cm cubes or on $15 \times 15 \times 15$ cm cubes depending upon the maximum size of the aggregate.

Curing : Protection or treatment of concrete for a specified period of time after placement to provide moisture for hydration of the cement, to provide proper temperature, and to protect the concrete from damage by loading or mechanical disturbance. The concrete is kept moist to arrest the rise of temperature which takes place during setting and hardening of concrete.

Curing Compound (Sealing Compound) : Liquid sprayed on the surface of fresh concrete to seal against loss of moisture.

Cylinder Strength : Cylinder strength test is one of the standard compressive strength test of concrete. The test specimen consists of 15 cm diameter and 30 cm high cylinder. Minimum cylinder compressive strength required is 0.8 times compressive strength of 15 cm cubes.

Damp Proofer : A substance, added to a batch of concrete as an admixture or applied to the hardened concrete as a paint or coating, which decreases capillarity.

Diatomaceous Earth : Fine-grained, chalky appearing material consisting of shells of diatoms (microscopic one-celled organisms) occurring in siliceous sedimentary deposits. Used as pozzolana.

Diffusivity : A measure of the capability of concrete to undergo temperature changes.

Discharge Height : It is the minimum distance from the discharge point of any mixer to the datum.

Dropchute (Elephant Trunk) : A series of conical sections of sheet steel pipe that forms a flexible downspout for coning concrete during a vertical fall. Each section is about 90 cm in diameter at the large end and 25 cm in diameter at the small, or lower end.

Dry : Stiff, nonplastic consistency of fresh concrete with low slump as opposed to soft or wet consistency.

Dry Pack : To patch with dry pack mortar. A mixture of cement and sand with just sufficient water to make it moist, used for patching deep, narrow cavities.

Dry Process : To process aggregate without use of water. Also, a process for manufacturing Portland cement.

Dry Shake (Dust Coat) : A dry mixture of cement and special fine aggregate broadcast on a floor slab before final finishing to provide a wear resistant surface.

Drying Shrinkage : Reduction in volume of hardened concrete as it dries out after placing.

Durability : Resistance of hardened concrete to forces or substances attempting to destroy it ; especially, resistance to weathering.

Dusting : Wearing away of a concrete surface, especially a floor of inferior hardness, under traffic.

Efflorescence : Crystalline salts deposited on a concrete surface by movement of water from the interior of the mass and subsequent evaporation.

Elastic Deformation : Deformation of concrete under load which disappears upon the removal of the load.

Entrained Air : Minute bubbles or spheroids of air formed in the concrete by the introduction of an air-entraining agent. One of the methods of reducing water cement ratio without sacrificing workability. The reduction of w.c. ratio increasing strength of concrete but at the same time presence of entrained air may cause upto 10% reduction in the strength of concrete.

Entrapped Air : Air voids larger than 1.25 mm in diameter mechanically entrapped in concrete.

Erosion : Wearing away of concrete by water containing suspended solids.

Expansion : Increase in volume of concrete caused by wetting or rise in temperature.

Expansion Joint : A joint in concrete that allows the concrete to contract and expand without damaging the structure or introducing excessive stresses.

Exposed Aggregate : Any process of finishing or surface treatment that results in clean aggregate particles being exposed on the surface for special architectural effect.

Fineness Modulus : It is an empirical factor obtained by adding the total percentage of a sample of aggregate retained on each of the specified series of sieves and dividing the sum by 100.

False Set (Gum Set, Rubber Set, Premature Stiffening) : Erratic, abnormal quick-setting of cement in concrete, caused by unstable gypsum in the cement. Subsequent working of the concrete "breaks down" false set.

Fat (Applied to a Concrete Mix) : Rich, cohesive, plastic, opposite of harsh.

Field-cured Specimen : Strength specimen cured at the structure site supposedly under the same conditions as the structural concrete.

Final Set : The time in the course of hardening of cement beyond which the concrete can no longer be made plastic.

Fine Aggregate (Sand) : The portion of the aggregate passing No. 4.75 sieve.

Fines : In aggregate processing, sand. Under size. In concrete finishing, silt and clay material mixed with cement and water.

Fineness Modulus : It is an empirical factor obtained by adding the total percentage of a sample of aggregate retained on each of the specified series of sieves and dividing the sum by 100.

Finish Screen : A screen at the batching plant for final removal of undersize and dirt from coarse aggregate just before it enters the plant bins.

Flash Set : Quick setting of cement caused by the use of excessively hot water and aggregates, or similar causes. A flash is permanent.

Flexural Vibrations : These are vibrations of a specimen mounted at 0.224 l from the end. It is used in non-destructive testing of concrete.

The modulus of elasticity E is given by

$$E = \frac{4\pi^2 l^2 f^2}{k^2 \lambda^2} \omega$$

where

E = Modulus of elasticity of the material

V = Velocity of sound in the material = $f \lambda$

f = Frequency

λ = Wavelength

l = Length of the span

k = Radius of gyration for the section about an axis perpendicular to plane of bending

ω = A numerical constant.

Float : A finishing tool used after screening and before troweling. The act of floating.

Fluidity (*An Element of Workability, Consistency*) : The wetness or softness of fresh concrete.

Fly Ash (*Precipitator Ash*) : Fine residue in flue gas from furnaces burning powdered coal. Particles are usually smaller than about 10μ . Used as a pozzolana. It is the combustion of ground or powdered coal and transported by the flue gases of boilers fired by pulverised coal.

Form Oil : Any liquid material applied to forms to prevent concrete from sticking. Some form oils remain liquid, other (lacquer) harden before concrete is placed.

Fresh Concrete : Concrete that has not reached its initial set.

Gap Grading : It is one of the methods of grading of aggregates in which some of the intermediate grades (sizes) of the aggregates are omitted.

Gel : An amorphous material formed during the hardening or setting of cement, composed of water and the dissolved constituents of the cement. Also, an amorphous, gelatinous exudation resulting from the alkali-aggregate reaction.

Gradation (*Grading, Mechanical Analysis, Sieve Analysis*) : The distribution of particles sizes of an aggregate on several specified sizes of sieves. Expressed either as individual or cumulative percents, either retained or passing.

Green Concrete : An indefinite term applied to concrete that has passed initial set, or final set, but has not yet gained appreciable strength.

Green Cracks (*Preset or Plastic Cracks*) : Cracking that occurs in concrete while in the green state.

Grout : (1) A fluid mixture of cement and water, sometimes with an admixture and sometimes containing sand, forced under pressure into voids such may exist, between concrete and rock in tunnel lining, or into cracks in rock foundations, or into joints in massive concrete structures. (2) Mortar, especially mortar spread on a construction joint or rock foundation ahead of concrete placing. Neat grout is composed of cement and water only.

Guniting : Shotcrete.

Hardening. Hardening of cement after addition of water is due to hydration and hydrolysis of Tricalcium Silicate, Tricalcium Aluminate etc. which form a glue or gel.

Harsh (Harshness) : Applied to a concrete mix : unworkable, lacking plasticity, noncohesive, tending to segregate easily.

Heat of Hydration : The heat liberated during the hydration or setting of cement.

Heavy Aggregate : Special aggregate of high specific gravity such as barite, magnetite or steel punchings, for producing high density concrete for radiation shielding and counterweights.

Heavy Concrete : High-density concrete for radiation shielding or counterweights. Density may exceed twice that of ordinary concrete.

Heavy Media : A high-density fluid for removing aggregate particles of low specific gravity by means of floatation. Usually a suspension of magnetic and ferrosilicon in water.

Honeycomb (Rock Pockets) : Voids in concrete resulting from incomplete consolidation.

Hydration : The chemical process of hardening of cement paste.

Hydration of Cement : The setting and hardening of cement is caused by the hydration of its constituents. Heat is generated during the process of hydration and hence during the period of setting and hardening of cement the structure has to be kept moist.

Hydrophobic Cement : This cement is manufactured by inter-grinding ordinary portland cement clinker with certain hydrophobic agents which impart water repelling property to the cement. Special feature of this cement is that it does not deteriorate during prolonged storage under unfavourable conditions.

Insulating Concrete : Lightweight concrete with density of 1500 kg/m³ or less, used for thermal insulation in roofs, etc., and for fire protection of structural elements in buildings.

Integral Water Proofer : An admixture which reduces flow or capillarity of water through concrete.

Immersion Vibrator : An equipment used for compacting concrete. It is particularly useful for narrow sections, closely reinforced concrete section and thin sections.

Jointing : Longitudinal and transverse joints are provided in concrete work to prevent progressive cracking up of concrete and for controlling expansion and contraction.

Laitance : A weak, light-grey substance consisting of cement, water and silt or clay from the aggregates, appearing on the top surfaces of concrete during and immediately after consolidation.

Leach : To wash out by the passage of water through a material.

Lead : In batching concrete, to commence the introduction of a material into the mixer ahead of another material.

Lean Mix : A concrete low in cement content. Opposite of rich mix.

Lift (A Layer) : The depth of concrete placed at one time.

Lightweight Concrete : Any concrete made with special low-density aggregate. Lightweight structural concrete has a density of approximately 1000 kg/m³. Lightweight insulating concrete has a density between 250 and 1500 kg/m³.

Longitudinal Vibration (see flexural vibration): The fundamental tone in this case is obtained by mounting the specimen at the centre.

The modulus of elasticity E is given by

$$E = \frac{4L^2 \omega f^2}{i^2}$$

where i is an integer depending upon the tone of vibrations.

Los Angeles Abrasion : A method for testing aggregates for hardness and abrasion resistance by tumbling a standard sample in a standard ball mill for a certain number of revolutions.

Map Cracking : A random distribution of cracks on the surface of concrete, sometimes in a roughly hexagonal or square pattern. May be quite fine, or deep and serious. Evidence of surface shrinkages or internal expansion.

Mass Concrete : Concrete placed in large masses, such as in a dam or large footing. It is lean concrete, containing aggregate as large as 150 mm and usually containing a pozzolana.

Membrane Waterproofing : A method of water proofing concrete below grade in which alternative layer of bituminous material (usually hot) and felt or fabric are applied to the concrete surface.

Mix (Fresh Concrete) : The mixture of aggregates, cement, water, and admixtures.

Mix Proportions : (1) The ratio by weight or by volume of the several constituents of concrete ; (2) The actual amounts of the constituents, usually in 1 cu. m. of concrete.

Mobility : An element of workability of concrete, best described as the ease with which the concrete can be moved about while in the plastic state.

Modular Ratio : The modular ratio between steel and concrete is the ratio of modulus of elasticity of steel and concrete $\frac{E_s}{E_c}$. The modulus of elasticity of concrete depends upon the grade of concrete. The modular ratio $\frac{E_s}{E_c}$ varies from 30 for M 100 to 7 for M 400.

Nailing Concrete : Any concrete proportioned to receive nails, such as for a roof flashing. A lightweight or sawdust concrete.

Neat Grout : A grout consisting of cement and water.

Non-destructive Testing of Concrete. It is one of the standard technique for testing of concrete. The methods adopted are :

1. *Resonant Frequency Method* : The method is based on the principle that frequency vibration of a beam is related to the ratio of modulus of elasticity.

2. *Pulse Technique Method* : The method is based on the measurement of time to travel through the specimen and the amplitude of the sound pulse of high frequency at the opposite face of the specimen.

Oversanded : Applied to a concrete mix ; containing an excess of fine aggregate.

Oversize : In aggregate, the material retained on the maximum specified sieve. For example, in 20 × 46 mm aggregate, the portion retained on 40 mm sieve.

PAM : Pneumatically applied mortar.

Paste : The cementing medium in concrete, consisting of cement and water.

Permeability : The property of concrete which allows water, under a hydrostatic head, to flow through interstices or channels in the concrete.

Pit Run (Bank Run) : Applied to aggregates, the conditions of the raw aggregate as it is excavated from the bank or pit.

Place : To deposit concrete in the forms or on the subgrade.

Plastic Shrinkage : Shrinkage of paste occurring while the concrete is still plastic, or after the concrete has become rigid but has not developed appreciable strength.

Plasticity : An element of workability. The property of fresh concrete to change shape under the application of an external force.

Plunger : It is a standard attachment to Vicat apparatus for determination of setting time to cement.

Portland Cement : Standard Portland Cement is the product obtained by pulverising clinker consisting essentially of hydraulic calcium silicate. Gypsum is added during the manufacture to adjust the setting time.

Popout : A blemish on the surface of concrete consisting of a conical piece of concrete, with the base on the surface of the concrete, pushed out by the expansion of an aggregate particle at the apex of the cone.

Pour : To place concrete. The amount of concrete placed during one continuous placement. A colloquialism.

Pozzolana : A siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

Precast Concrete : Any concrete that is cast in moulds or forms at a location other than its final location in the structure. Especially concrete products.

Prestressed Concrete : Concrete in which a compressive load is applied during the manufacturing process by means of the application of a tensile load to steel strands, wires or rods in the concrete. The load is transferred as a compressive load in the concrete by means of bond with the steel or special fixtures where the tendons emerge from the concrete.

Pretensioned : Prestressed by first tensioning the steel tendons, then placing the concrete about them. After the concrete reaches the required strength, stress is transferred to the concrete by releasing the anchorages holding the strands at the ends of the casting bed.

Pumpcrete : Trade name for a machine for pumping fresh concrete through a pipeline.

Pumping : In a pavement, loss of fines from the subgrade through cracks or joints in the pavement under action of traffic. Fines are carried through the crack by water forced through the crack when a vehicle depresses the slab slightly on a fine-grained, nondraining base or foundation.

Quarter : To divide an aggregate sample into quarter parts for the purpose of reducing the sample quantity to a size suitable for testing.

Reactive Aggregate : An aggregate that undergoes a destructive reaction after its inclusion in concrete. Specifically, certain siliceous minerals and rocks that react with cement alkalies, causing a destructive internal expansion of hardened concrete.

Ready-Mixed Concrete : Concrete that is mixed before delivery to the job sites. It may be mixed in a central plant and hauled to the job site in truck hauling units (agitating or nonagitating), or it may be batched into a mixer mounted on a truck and mixed en route to the site, or a combination of partial mixing in the central plant and mixing en route in a truck mixer.

Retarder : An admixture that slows or retards the setting of cement, but has little or no effect on strength gain of the paste after initial set.

Return : The actual number of cubic metres of concrete in a designed or theoretical 1 cu. m batch, based on tests of the fresh concrete.

Ribbon Feed : A batching sequence in which all materials are fed into the mixer practically simultaneously.

Rich : A mix high in cement content. Opposite of lean.

Rock Ladder : A series of inclined steps, arranged in a vertical column, to break up the vertical drop of coarse aggregate as it is discharged from a belt or chute, for the purpose of minimising breakage of the aggregate.

Rubbed Surface : A formed concrete surface modified by rubbing with a carborundum stone, or with burlap and mortar, to improve the appearance.

Sand (Fine Aggregate) : The portion of aggregate passing a No. 4.75 mm sieve.

Sand Streak : A blemish on a formed concrete surface resulting from loss of mortar or grout through cracks in the forms, or resulting from failure to consolidate the concrete.

Sawdust Concrete : Concrete of low strength containing sawdust as "aggregate", used for lightweight nailing concrete for roof flashings and similar construction.

Scale : To come off the surface by peeling or flaking ; especially as applied to pavements, to peel or flake the influence of de-icing agents.

Scalp : To remove certain portions of pit-run aggregate, either fine or coarse, in a preliminary screening operation.

Screed : Any of several guides of concrete ; especially (1) one of a pair of temporary pipes or strips of wood set accurately to grade, on which the strike-off board slides while removing excess concrete; and (2) the strike-off board itself.

Scrubber : A machine for cleaning coarse aggregate consisting of a horizontal rotating cylinder containing blades that lift and tumble the aggregate, usually in the presence of water, to remove soft particles and coatings.

Sealing Compound : (1) A bituminous material for filling or sealing joints and cracks; (1) Curing compound.

Segregation : In aggregate, separation of the fine portion of the material from the coarser portion. In concrete, separation of coarse aggregate from the mortar or main mass of the concrete.

Setting Time : The period of time elapsed between the mixing of water with cement, and certain arbitrary points in the hydration or setting process. It is determined by the penetration of a standard needle into a sample of cement paste in a specified period of time. "Initial set" and "final set" are arbitrary values of penetration, indicating respectively the time when the paste (and consequently the concrete) starts to lose plasticity, and the time the paste or concrete starts to become rigid.

Settlement Crack : A crack in the soffit of a beam, or top of a wall or column where it joins a slab, resulting from continuous placing of concrete in the beam, wall or column, and the slab. Shrinkage and restraint at the juncture between the structural elements cause a green crack.

Shotcrete : A mixture of cement, sand, and water, applied by shooting into place with compressed air. Also gunite, or pneumatically applied mortar.

Shrink-mixed Concrete : A form of ready-mixed concrete, in which the ingredients are combined in a stationary mixer (shrink), then dumped into a truck mixer, where mixing is completed in transit.

Shrinkage Cracks : Any cracking that results from shrinkage of the concrete.

Slag : A nonmetallic by-product of steel blast furnaces, crushed and sized for concrete aggregate. When quenched in water, a lightweight aggregate is produced.

Slip Form : A sliding form that produces a continuous placement of concrete as the form is moved along, either vertically, as for a silo, or horizontally, as for a canal lining.

Slurry (Neat Grout) : A thin mixture of cement and water.

Slump Test : Standard field test for determining workability of concrete. The test is carried out in a standard slump test cone having 200 mm and 100 mm bottom and top diameters respectively. The concrete under test is filled in specified layers and compacted under standard conditions. The vertical settlement of concrete on removal of the cone is termed as *slump* of the mix.

Spall : To crumble at a joint or along an edge. Also, a fragment of concrete broken off in this manner.

Split : To divide a sample into smaller parts.

Spreader : (1) A machine for distributing or spreading concrete on a pavement base ahead of the finisher. (2) A metal rod or piece of wood temporarily inserted in a form to hold the form in alignment until concrete is placed.

Standard Consistency : Standard consistency of cement is defined as that consistency (percentage of water) which permits the Vicat's plunger to penetrate to a point 5 to 7 mm from the bottom of the Vicat mould when cement paste is tested in the prescribed manner.

Sticky : Applied to a concrete mix ; fat, rich-appearing, plastic opposite of harsh.

Stiff : Applied to a concrete mix ; dry, lacking plasticity, low slump.

Strand : A group of wires twisted into a cable for use in prestressed concrete. A tendon.

Suction : Absorption into the pores of a concrete surface. Customarily used in connection with the absorption of paint.

Surface Area : It is a property of cement associated with its fineness. The fineness in terms of surface area is expressed as the area in sq. cm covered by one gm of cement. For ordinary portland cement surface area per gram of cement should not be less than 2250 sq. cm.

Surface Water : It is free water on surface of aggregate particles which is considered as part of mixing water in concrete as separated from absorbed mixture.

Tendon : A wire, group of wires, or strand, for applying prestress to concrete.

Test Batch : A routine, normal batch of concrete from which samples are taken for routine-job quality-control tests, such as slump, air content, yield, and strength.

Thermal Incompatibility : A condition in which part of the aggregate has such different values of thermal properties especially coefficient of expansion, when compared with other portions of the aggregate or the cement paste in any given concrete, as to cause damage or distress to the hardened concrete.

Transit Mixer : It is used in truck mixed type of ready mix concrete to keep the concrete mix agitated during its transit.

Tool and Plant

1. **Air blown pipe** : Air jet used in *shotcrete* work.

2. **Air gun** : A machine in which a mixture of cement and fine aggregate is forced by compressed air.

3. **Air meter** : A device for measuring air cement of concrete and mortar.

4. **Arrising tool** : A tool similar to float, but having a form suitable for rounding an edge of freshly placed concrete.

5. **Batch mixer** : A concrete mixer for cyclic operations in which the ingredients for concrete are charged in batcher.

6. **Bull flat** : A large float rectangular piece of wood or aluminium used to smoothen unformed surfaces.

7. *Concrete breaker* : A compressed air operated tool used for breaking concrete on demolition work.

8. *Concrete vibrating machine* : A machine commonly carried on side forms or on rail parallel thereto, which compacts a layer of freshly mixed concrete.

9. *Continuous mixer* : A mixer into which the ingredients of the mix are fed without stopping.

10. *Darby* : A hand manipulated straight edge.

11. *Elephant trunk* : An articulated tube or chute used in placement of concrete.

12. *Grizzly* : A simple stationary screen on series of equally spaced parallel bars set at an angle to segregate oversize particle.

13. *Hawk* : A tool used by plasters to hold and carry plaster mortar.

14. *Scalper* : A screen for removing oversize particles.

15. *Tremic* : a pipe or tube through which concrete is deposited under water.

Transit-mixed Concrete : Concrete that is mixed in a truck mixer en route from the proportioning plant to the jobsite.

Tremic : A pipe, at least 25 cm in diameter, consisting of sections joined together with flanged and gasketed coupling, with a funnel-shaped section at the top to receive concrete for placing under water.

Trial Mix : A preliminary batch of concrete mixed in the laboratory to determine the proportions of materials to produce concrete having certain specified properties.

Truck Mixer : A mixer mounted on a motor truck for mixing concrete while in transit from the proportioning plant to the jobsite.

Ultimate Creep Strain : The ultimate creep strain C for a sustained unit is given by the formula

$$C = 1.5 \left(\frac{1.25H}{0.25} \right) \left(\sqrt{\frac{400}{F_e}} \right) \left(\frac{F_e}{F_e} \right) \times 10^{-6} \text{ per kg/cm}^2$$

where H = Average ambient humidity of the environment.

Undersanded : The condition of concrete in which it appears to contain insufficient fine aggregate.

Undersize : In aggregate, the material passing the minimum specified sieve size. For example, in 20×40 mm aggregate, it is the portion passing the 20 mm sieve.

Vacuum Concrete : Concrete that has been subjected to a vacuum, applied by means of mats placed on the surface of slab, or by means of special form panels, for the purpose of removing water and entrapped air from the surface layer of concrete to improve durability, strength, and hardness of the surface.

Vibration : The act of rendering fresh concrete into a quasi-liquid state by the application of high-frequency vibratory impulses for the purposes of consolidation in the forms.

Vibration Limit : A limiting point in the hardening or setting time of concrete, determined by the penetration needle, beyond which the concrete can no longer be made plastic by vibration.

Vibrating table : Standard table conforming to IS : 226-1962 used for imparting uniform energy for consolidation of concrete. It is particularly employed in the production of pre-cast concrete building units.

Vicat apparatus : Standard equipment conforming to IS:5513-1969 for determination of initial and final setting time of cement.

Volume Change : Expansion and contraction of hardened concrete resulting from wetting and drying or temperature variations.

Wash Water : Water carried on a truck mixer or agitator for washing out the mixer drum after discharge of the batch.

Water-Cement Ratio : (1) The ratio of the weight of total water to the weight of cement in a batch of concrete ; (2) The number of litres of water per bag of cement in a batch of concrete. The amount of free water (but no absorbed water) in the aggregate is included in either case.

Water Reducer : An admixture that reduces the amount of mixing water required per batch of concrete, at the same time maintaining equal or superior workability and slump.

Waterproofing : A substance, added to a batch of concrete as an admixture, or applied to the hardened concrete as a paint or coating, which decreases permeability.

Weathering : Deterioration or decay of concrete under the influence of freezing and thawing, wetting and drying, and temperature changes.

Wet : As applied to consistency of fresh concrete : high slump, fluid, soft, opposite of dry.

Workability : The ease with which a given set of materials can be mixed into concrete and subsequently handled, transported, and placed with minimum loss of homogeneity.

Workability Agent : An admixture added to concrete for the purpose of improving workability.

Yield : The number of cubic metres of concrete produced per bag of cement. Equals total volume per batch divided by the number of bags per batch.