



Quality and Service Since 1953

(540) 433-2482 | 1 (800) 296-2482

## Glossary of Terms & Measures

The intent of this *Glossary* is to clarify terminology used in concrete construction, with special emphasis on those terms used in *Design and Control of Concrete Mixtures*. Additional terminology that may not be in this book is included in the *Glossary* for the convenience of our readers. Other sources for terms include ACI Committee 116, and ASTM standards.

\*Information Taken From:  
PCA Design and Control of Concrete Mixtures 14th Edition

*Superior Concrete, Inc., assumes no responsibility for typographical errors or omissions that may be contained in this document. This reference is for general informational purposes only.*



## A

**Absorption**—see *Water absorption*.

**Accelerating admixture**—admixture that speeds the rate of hydration of hydraulic cement, shortens the normal time of setting, or increases the rate of hardening, of strength development, or both, of portland cement, concrete, mortar, grout, or plaster.

**Addition**—substance that is interground or blended in limited amounts into a hydraulic cement during manufacturing – not at the jobsite – either as a “processing addition” to aid in manufacture and handling of the cement or as a “functional addition” to modify the useful properties of the cement.

**Admixture**—material, other than water, aggregate, and hydraulic cement, used as an ingredient of concrete, mortar, grout, or plaster and added to the batch immediately before or during mixing.

**Aggregate**—granular mineral material such as natural sand, manufactured sand, gravel, crushed stone air-cooled blast-furnace slag, vermiculite, or perlite.

**Air-content**—total volume of air voids, both entrained and entrapped, in cement paste, mortar, or concrete. Entrained air adds to the durability of hardened mortar or concrete and workability of fresh mixtures.

**Air entrainment**—intentional introduction of air in the form of minute, disconnected bubbles (generally smaller than 1 mm) during mixing of portland cement concrete, mortar, grout, or plaster to improve desirable characteristics such as cohesion, workability, and durability.

**Air-entraining admixture**—admixture for concrete, mortar, or grout that will cause air to be incorporated into the mixture in the form of minute bubbles during mixing, usually to increase the material’s workability and frost resistance.

**Air-entraining portland cement**—portland cement containing an air-entraining addition added during its manufacture.

**Air void**—entrapped air pocket or an entrained air bubble in concrete, mortar, or grout. Entrapped air voids usually are larger than 1 mm in diameter; entrained air voids are smaller. Most of the entrapped air voids should be removed with internal vibration, power screeding, or rodding.

**Alkali-aggregate reactivity**—production of expansive gel caused by a reaction between aggregates containing certain forms of silica or carbonates and alkali hydroxides in concrete.

**Architectural concrete**-concrete that will be permanently exposed to view and which therefore requires special care in selection of concrete ingredients, forming, placing, consolidating, and finishing to obtain the desired architectural appearance.

**Autoclaved cellular concrete**-concrete containing very high air content resulting in low density, and cured at high temperature and pressure in an autoclave.

## B

**Batching**-process of weighing or volumetrically measuring and introducing into the mixer the ingredients for a batch of concrete, mortar, grout, or plaster.

**Blast-furnace slag**-nonmetallic byproduct of steel manufacturing, consisting essentially of silicates and aluminum silicates of calcium that are developed in a molten condition simultaneously with iron in a blast furnace.

**Bleeding**-flow of mixing water from a newly placed concrete mixture caused by the settlement of the solid materials in the mixture.

**Blended hydraulic cement**-cement containing combination of portland cement, pozzolans, slag, and/or other hydraulic cement.

**Bulking**-increase in volume of a quantity of sand when in a moist condition compared to its volume when in a dry state.

## C

**Calcined clay**-clay heated to high temperature to alter its physical properties for use as a pozzolan or cementing material in concrete.

**Calcined shale**-shale heated to high temperature to alter its physical properties for use as a pozzolan or cementing material in concrete.

**Carbonation**-reaction between carbon dioxide and a hydroxide or oxide to form a carbonate.

**Cellular concrete**-high air content or high void ratio concrete resulting in low density.

**Cement**-see *Portland cement* and *Hydraulic cement*.

**Cement paste**-constituent of concrete, mortar, grout, and plaster consisting of cement and water.

**Cementitious material (cementing material)**-any material having cementing properties or contributing to the formation of hydrated calcium silicate compounds. When proportioning concrete, the following are considered cementitious materials: portland

cement, blended hydraulic cement, fly ash, ground granulated blast-furnace slag, silica fume, calcined clay, metakaolin, calcined shale, and rice husk ash.

**Chemical admixture**—see *Admixture*.

**Chemical bond**—bond between materials resulting from cohesion and adhesion developed by chemical reaction.

**Clinker**—end product of a portland cement kiln; raw cementitious material prior to grinding.

**Chloride (attack)**—chemical compounds containing chloride ions, which promote the corrosion of steel reinforcement. Chloride deicing chemicals are primary sources.

**Coarse aggregate**—natural gravel, crushed stone, or iron blast-furnace slag, usually larger than 5 mm (0.2 in.) and commonly ranging in size between 9.5 mm and 37.5 mm (3/8 in. to 1 1/2 in.).

**Cohesion**—mutual attraction by which elements of a substance are held together.

**Colored concrete**—concrete containing white cement and/or mineral oxide pigments to produce colors other than the normal gray hue of traditional gray cement concrete.

**Compaction**—process of inducing a closer arrangement of the solid particles in freshly mixed and placed concrete, mortar, or grout by reduction of voids, usually by vibration, tamping, rodding, puddling, or a combination of these techniques. Also called consolidation.

**Compressive strength**—maximum resistance that a concrete, mortar, or grout specimen will sustain when loaded axially in compression in a testing machine at a specified rate; usually expressed as force per unit of cross sectional area, such as megapascals (MPa) or pounds per square inch (psi).

**Concrete**—mixture of binding materials and coarse and fine aggregates. Portland cement and water are commonly used as the binding medium for normal concrete mixtures, but may also contain pozzolans, slag, and/or chemical admixtures.

**Consistency**—relative mobility or ability of freshly mixed concrete, mortar, or grout to flow. (See also *Slump* and *Workability*).

**Construction joint**—a stopping place in the process of construction. A true construction joint allows for bond between new concrete and existing concrete and permits no movement. In structural applications their location must be determined by the structural engineer. In slab on grade applications, construction joints are often located at contraction (control) joint locations and are constructed to allow movement and perform as contraction joints.

**Contraction joint**—weakened plane to control cracking due to volume change in a concrete structure. Joint may be grooved, sawed, or formed. Also known as a “Control joint.”

**Corrosion**—deterioration of metal by chemical, electrochemical, or electrolytic reaction.

**Creep**—time-dependant deformation of concrete, or of any material, due to a sustained load.

**Curing**—process of maintaining freshly placed concrete mortar, grout, or plaster moist and at a favorable temperature for a suitable period of time during its early stages so that the desired properties of the material can develop. Curing assures satisfactory hydration and hardening of the cementitious materials.

## D

**Dampproofing**—treatment of concrete, mortar, grout, or plaster to retard the passage or absorption of water, or water vapor.

**Density**—mass per unit volume; the weight per unit volume in air, expressed, for example, in kg/m<sup>3</sup> (lb/ft<sup>3</sup>).

**Durability**—ability of portland cement concrete, mortar, grout, or plaster to resist weathering action and other conditions of service, such as chemical attack, freezing and thawing, and abrasion.

## E

**Early stiffening**—rapidly developing rigidity in freshly mixed hydraulic cement paste, mortar, grout, plaster, or concrete.

**Entrapped air**—irregularly shaped, unintentional air voids in fresh or hardened concrete 1 mm or larger in size.

**Entrained air**—spherical microscopic air bubbles—usually 10 *mm* to 1000 *mm* in diameter—intentionally incorporated into concrete to provide freezing and thawing resistance and/or improve workability.

**Epoxy resin**—class of organic chemical bonding systems used in the preparation of special coatings or adhesives for concrete or masonry or as binders in epoxy-resin mortars and concretes.

**Ettringite**—needle like crystalline compound produced by the reaction of C<sub>3</sub>A, gypsum, and water within a Portland cement concrete.

**Expansion joint**—a separation provided between adjoining parts of a structure to allow movement.

## F

**Ferrocement**—one or more layers of steel or wire reinforcement encased in portland cement mortar creating a thin-section composite material.

**Fibers**—thread or thread like material ranging from 0.05 to 4 mm (0.002 to 0.16 in.) in diameter from 10 to 150 mm (0.5 to 6 in.) in length and made of steel, glass, synthetic (plastic), carbon, or natural materials.

**Fiber concrete**—concrete containing randomly oriented fibers in 2 or 3 dimensions through out the concrete matrix.

**Fine aggregate**—aggregate that passes the 9.5 mm (3/8 in.) sieve, almost entirely passes the 4.75 mm (No. 4) sieve, and is predominantly retained on the 75 mm (No. 200) sieve.

**Fineness modulus (FM)**—factor obtained by adding the cumulative percentages of material in a sample of aggregate retained on each of a specified series of sieves and dividing the sum by 100.

**Finishing**—mechanical operations like screeding, consolidating, floating, troweling, or texturing that establish the final appearance of any concrete surface.

**Fire resistance**—that property of a building material, element, or assembly to withstand fire or give protection from fire; it is characterized by the ability to confine a fire or to continue to perform a given structural function during a fire, or both.

**Flexural strength**—ability of solids to resist bending.

**Fly ash**—residue from coal combustion, which is carried in flue gases, and is used as a pozzolan or cementing material in concrete.

**Forms**—temporary supports for keeping fresh concrete in place until it has hardened to such a degree as to be self supporting (when the structure is able to support its dead load).

**Freeze-thaw resistance**—ability of concrete to withstand cycles of freezing and thawing. (See also *Air entrainment* and *Air-entraining admixture*.)

**Fresh concrete**—concrete that has been recently mixed and is still workable and plastic.

## G

**Grading**—size distribution of aggregate particles, determined by separation with standard screen sieves.

**Grout**—mixture of cementitious material with or without aggregate or admixtures to which sufficient water is added to produce a pouring or pumping consistency without segregation of the constituent materials.

## H

**Hardened concrete**—concrete that is in a solid state and has developed a certain strength.

**High-density concrete (heavyweight concrete)**—concrete of very high density; normally designed by the use of heavyweight aggregates.

**High-strength concrete**—concrete with a design strength of at least 70 MPa (10,000 psi).

**Honeycomb**—term that describes the failure of mortar to completely surround coarse aggregates in concrete, leaving empty spaces (voids) between them.

**Hydrated lime**—dry powder obtained by treating quicklime with sufficient water to satisfy its chemical affinity for water; consists essentially of calcium hydroxide or a mixture or a mixture of calcium hydroxide and magnesium oxide or magnesium hydroxide, or both.

**Hydration**—in concrete, mortar, grout, and plaster, the chemical reaction between hydraulic cement and water in which new compounds with strength-producing properties are formed.

**Hydraulic cement**—cement that sets and hardens by chemical reaction with water, is capable of doing so under water. (See also *Portland cement*.)

## I

**Inch-pound units**—units of length, area, volume, weight, and temperature commonly used in the United States during the 18<sup>th</sup> to 20<sup>th</sup> centuries. These include, but are not limited to (1) length—inches, feet, yards, and miles; (2) area—square inches, square feet, square yards, and square miles; (3) volume—cubic inches, cubic feet, cubic yards, gallons, and ounces; (4) weight—pounds and ounces; and (5) temperature—degrees Fahrenheit.

**Isolation Joint**—separation that allows adjoining parts of a structure to move freely to one another, both horizontally and vertically.

## J

**Joint**—see *Construction joint*, *Contraction joint*, *Isolation joint*, and *Expansion joint*.

## K

**Kiln**—rotary furnace used in cement manufacture to heat and chemically combine raw inorganic materials, such as limestone, sand and clay, into calcium silicate clinker.

## L

**Lightweight aggregate**—low-density aggregate used to produce lightweight (low-density) concrete. Could be expanded or sintered clay, slate, diatomaceous shale, perlite, vermiculite, or slag; natural pumice, scoria, volcanic cinders, tuff, or diatomite; sintered fly ash or industrial cinders.

**Lightweight concrete**—low-density concrete compared to normal-density concrete.

**Lime**—general term that includes the various chemical and physical forms of quicklime, hydrated lime, and hydraulic lime. It may be high-calcium, magnesian, or dolomitic.

## M

**Masonry**—concrete masonry units, clay brick, structural clay tile, stone, terra cotta, and the like, or combinations thereof, bonded with mortar, dry-stacked, or anchored with metal connectors to form walls, building elements, pavements, and other structures.

**Masonry cement**—hydraulic cement, primarily used in masonry and plastering construction, consisting of a mixture of portland or blended hydraulic cement and plasticizing materials (such as limestone, hydrated or hydraulic lime) together with other materials introduced to enhance one or more properties such as setting time, workability, water retention, and durability.

**Mass concrete**—cast-in-place concrete in volume large enough to require measures to compensate for volume change caused by temperature rise from heat of hydration in order to keep cracking to a minimum.

**Metakaolin**—highly reactive pozzolan made from kaolin clays

**Metric units**—also call System International (SI) Units. System of units adopted by most of the world by the 21<sup>st</sup> Century. These include but are not limited to: (1) length-millimeters, meters, and kilometers; (2) area-square millimeters and square meters; (3) volume-cubic meters and liters; (4) mass-milligrams, grams, kilograms, and megagrams; and (5) degrees Celsius.

**Mineral admixtures**—see *Supplementary cementitious materials*.

**Modulus of elasticity**—ratio of normal stress to corresponding strain for tensile or compressive stress below the proportional limit of the material; also referred to as elastic modulus, Young's modulus, and Young's modulus of elasticity; denoted by the symbol *E*.



**Moist-air curing**—curing with moist air (no less than 95% relative humidity) at atmospheric pressure and a temperature of about 23 degrees C (73 degrees F).

**Mortar**—mixture of cementitious materials, fine aggregate, and water, which may contain admixtures, and is usually used to bond masonry units.

**Mortar cement**—hydraulic cement, primarily used in masonry construction, consisting of a mixture of portland or blended hydraulic cement and plasticizing materials (such as limestone, hydrated or hydraulic lime) together with other materials introduced to enhance one or more properties such as setting time, workability, water retention, and durability. Mortar cement and masonry cement are similar in use and function. However, specifications for mortar cement usually require lower air contents and they include a flexural bond strength requirement.

## N

**Normal weight concrete**—class of concrete made with normal density aggregates, usually crushed stone or gravel, having a density of approximately 2400 kg/m<sup>3</sup> (150 lb/ft<sup>3</sup>). (See also *Lightweight concrete* and *High-density concrete*.)

**No-slump concrete**—concrete having a slump of less than 6 mm (1/4 in.).

## O

**Overlay**—layer of concrete or mortar placed on or bonded to the surface of an existing pavement or slab. Normally done to repair a worn or cracked surface. Overlays are seldom less than 25 mm (1 in.) thick.

## P

**Pavement (concrete)**—highway, road, street, path, or parking lot surfaced with concrete. Although typically applied to surfaces that are used for travel, the term also applies to storage areas and playgrounds.

**Permeability**—property of allowing passage of fluids or gases

**Pervious concrete (no fines or porous concrete)**—concrete containing insufficient fines or no fines to fill the voids between aggregate particles in a concrete mixture. The coarse aggregate particles are coated with a cement and water paste to bond the particles at their contact points. The resulting concrete contains an interconnected pore system allowing storm water to drain through the concrete to the subbase below.

**pH**—chemical symbol for the logarithm of the reciprocal of hydrogen ion concentration in gram atoms per liter, used to express the acidity of alkalinity (base) of a solution on a scale of 0 to 14, where less than 7 represents acidity, and more than 7 alkalinity.

**Plastic cement**—special hydraulic cement product manufactured for plaster and stucco application. One or more inorganic plasticizing agents are interground or blended with the cement to increase the workability and molding characteristics of the resultant mortar, plaster, or stucco.

**Plasticity**—that property of freshly mixed cement paste, concrete, mortar, grout, or plaster that determines its workability, resistance to deformation, or ease of molding.

**Plasticizer**—admixture that increases the plasticity of portland cement concrete, mortar, grout, or plaster.

**Polymer-portland cement concrete**—fresh portland cement concrete to which a polymer is added for improved durability and adhesion characteristics, often used in overlays for bridge decks; also referred to as polymer-modified concrete and latex-modified concrete.

**Popout**—shallow depression in a concrete surface resulting from the breaking away of pieces of concrete due to internal pressure.

**Portland blast-furnace slag cement**—hydraulic cement consisting of: (1) an intimately interground mixture of portland-cement clinker and granulated blast-furnace slag; (2) an intimate and uniform blend of portland cement and fine granulated blast-furnace slag; or (3) finely ground blast-furnace slag with or without additions.

**Portland cement**—Calcium silicate hydraulic cement produced by pulverizing portland-cement clinker, and usually containing calcium sulfate and other compounds. (See also *Hydraulic cement*.)

**Portland cement plaster**—a combination of portland cement-based cementitious material(s) and aggregate mixed with a suitable amount of water to form a plastic mass that will adhere to a surface and harden, preserving any form and texture imposed on it while plastic. See also *Stucco*.

**Portland-pozzolan cement**—hydraulic cement consisting of an intimate and uniform blend of portland cement or portland blast-furnace slag cement and fine pozzolan produced by intergrinding portland cement clinker and pozzolan, by blending portland cement or portland blast-furnace slag cement and finely divided pozzolan, or a combination of intergrinding and blending, in which the amount of the pozzolan constituent is within specified limits.

**Pozzolan**—siliceous or siliceous and aluminous materials, like fly ash or silica fume, which in itself possess little or no cementitious value but which 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**—concrete cast in forms in a controlled environment and allowed to achieve a specified strength prior to placement on location.

**Prestressed concrete**-concrete in which compressive stresses are induced by high-strength steel tendons or bars in a concrete element before loads are applied to the element which will balance the tensile stresses imposed in the element during service. This may be accomplished by the following: Post-tensioning-a method of prestressing in which the tendons/bars are tensioned after the concrete has hardened; or Pre-tensioning-a method of prestressing in which the tendons are tensioned before the concrete is placed.

## Q

**Quality control**-actions taken by a producer or contractor to provide control over what is being done and what is being provided so that applicable standards of good practice for the work are followed.

## R

**Reactive-powder concrete**-high-strength, low-water and low-porosity concrete with high silica content and aggregate particle sizes of less than 0.3 mm.

**Ready-mixed concrete**-concrete manufactured for delivery to a location in a fresh state.

**Recycled concrete**-hardened concrete that has been processed for reuse, usually as an aggregate.

**Reinforced concrete**-concrete to which tensile bearing materials such as steel rods or metal wires are added for tensile strength.

**Relative density**-a ratio relating the mass of a volume of material to that of water; also called specific gravity.

**Relative humidity**-The ratio of the quantity of water vapor actually present in the atmosphere to the amount of water vapor present in a saturated atmosphere at a given temperature, expressed as a percentage.

**Retarder**-an admixture that delays the setting and hardening of concrete.

**Roller-compacted concrete (RCC)**-a zero slump mix of aggregates, cementitious materials and water that is consolidated by rolling with vibratory compactors; typically used in the construction of dams, industrial pavements, storage and composting areas, and as a component of composite pavements for highways and streets.

## S

**Scaling**-disintegration and flaking of a hardened concrete surface, frequently due to repeated freeze-thaw cycles and application of deicing chemicals.

**Segregation**-separation of the components (aggregates and mortar) of fresh concrete, resulting in a nonuniform mixture.

**Self-compacting concrete**-concrete of high workability that require little or no vibration or other mechanical means of consolidation.

**Set**-the degree to which fresh concrete has lost its plasticity and hardened.

**Silica fume**-very fine noncrystalline silica which is a byproduct from the production of silicon and ferrosilicon alloys in an electric arc furnace; used as a pozzolan in concrete.

**Shotcrete**-mortar or small-aggregate concrete that is conveyed by compressed air through a hose and applied at high velocity to a surface. Also known as gunite and sprayed concrete.

**Shrinkage**-decrease in either length or volume of a material resulting from changes in moisture content, temperature, or chemical changes.

**Shrinkage-compensating concrete**-concrete containing expansive cement, or an admixture, which produces expansion during hardening and thereby offsets the contraction occurring later during drying (drying shrinkage).

**Slag cement**-hydraulic cement consisting mostly of an intimate and uniform blend of ground, granulated blast-furnace slag with or without portland cement or hydrated lime.

**Slump**-measure of the consistency of freshly mixed concrete, equal to the immediate subsidence of a specimen molded with a standard slump cone.

**Slurry**-thin mixture of an insoluble substance, such as portland cement, slag, or clay, with a liquid, such as water.

**Soil cement**-mixture of soil and measured amounts of portland cement and water compacted to a high density; primarily used as a base material under pavements; also called cement-stabilized soil.

**Specific gravity**-see *Relative density*.

**Stucco**-portland cement plaster and stucco are the same material. The term “stucco” is widely used to describe the cement plaster used for coating exterior surfaces of buildings. However, in some geographical areas, “stucco” refers only to the factory-prepared finish coat mixtures. (See also *Portland cement plaster*.)

**Sulfate attack**-most common form of chemical attack on concrete caused by sulfates in the groundwater or soil manifested by expansion and disintegration of the concrete.

**Superplasticizer (plasticizer)**-admixture that increases the flowability of a fresh concrete mixture.

**Supplementary cementitious (cementing) materials**-Cementitious material other than portland cement or blended cement. See also *Cementitious material*.

## T

**Tensile strength**-stress up to which concrete is able to resist cracking under axial tensile loading.

## U

**UBC**-Uniform Building Code, published by the International Conference of Building Officials, Whittier, California.

**Unit Weight**-density of fresh concrete or aggregate, normally determined by weighing a known volume of concrete or aggregate (bulk density of aggregates includes voids between particles).

## V

**Vibration**-high frequency agitation of freshly mixed concrete through mechanical devices, for the purpose of consolidation.

**Volume change**-Either an increase or a decrease in volume due to any cause, such as moisture changes, temperature changes, or chemical changes. (See also *Creep*.)

## W

**Water absorption**-(1) The process by which a liquid (water) is drawn into and tends to fill permeable pores in a porous solid. (2) The amount of water absorbed by a material under specified test conditions, commonly expressed as a percentage by mass of the test specimen.

**Water to cementing (cementitious) materials ratio**-ratio of mass of water to mass of cementing materials in concrete, including portland cement, blended cement, hydraulic cement, slag, fly ash, silica fume, calcined clay, metakaolin, calcined shale, and rice husk ash.

**Water to cement ratio (water-cement ratio and w/c)**-ratio of mass of water to mass of cement in concrete.

**Water reducer**-admixture whose properties permit a reduction of water required to produce a concrete mix of a certain slump, reduce water-cement ratio, reduce cement content, or increase slump.

**White portland cement**-cement manufactured from raw materials of low iron content.

**Workability**-That property of freshly mixed concrete, mortar, grout, or plaster that determines its working characteristics, that is, the ease with which it can be mixed, placed, molded, and finished. (See also *Slump* and *Consistency*.)

## Y

**Yield**-volume per batch of concrete expressed in cubic meters (cubic feet).

## Z

**Zero-slump concrete**-concrete without measurable slump (see also *No-slump concrete*).