ACI Concrete Terminology

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A/F ratio — the molar or mass ratio of aluminum oxide (Al_2O_3) to iron oxide (Fe_2O_3), as in portland cement.

Abrams' law — a rule stating that, with given concrete materials and conditions of test, the ratio of the amount of water to the amount of the cement in the mixture determines the strength of the concrete, provided the mixture is of a workable consistency. (See also **water-cement ratio**.)

abrasion damage — wearing away of a surface by rubbing and friction. (See also **cavitation damage** and **erosion**.)

abrasion resistance — ability of a surface to resist being worn away by rubbing and friction.

absolute volume — (1) in the case of solids, the displacement volume of particles themselves, including their permeable and impermeable voids, but excluding space between particles; (2) in the case of fluids, their volume.

absorbed moisture — moisture that has entered the permeable pores of a solid and has physical properties not substantially different from ordinary water at the same temperature and pressure. (See also **absorption**.)

absorbed water — see **absorbed moisture**

absorption — (1) the process by which a liquid is drawn into and tends to fill permeable voids in a porous solid body; (2) the increase in mass of a porous solid body resulting from the penetration of a liquid into its permeable voids.

abutment — (1) in bridges, the end foundation that is typically constructed with concrete that supports the superstructure of the bridge; (2) in dams, the side of the gorge or bank of the stream against which a dam abuts.

accelerating admixture — an admixture that causes an increase in the rate of hydration of the hydraulic cement and thus shortens the time of setting, increases the rate of strength development, or both.

acceleration — increase in rate of natural progress of setting or hardening of concrete. (See also **accelerating admixture**.)

accelerator — see **accelerating admixture**

accidental air — see **entrapped air** (preferred term)

acid etching — the removal of a cementitious surface through controlled dissolution to expose sand or aggregates, roughen a smooth cementitious surface in preparation for cementitious coating material application, or create art, create design, or create an architectural finish.

acrylic resin — one of a group of thermoplastic resins formed by polymerizing the esters or amides of acrylic acid used to make polymer-modified concrete and polymer concretes.

active crack — a crack whose width changes with time.

addition — a material that is interground or blended in limited amounts into a hydraulic cement during manufacture either as a processing addition to aid in manufacturing and handling the cement or as a functional addition to modify the use properties of the finished product.

additive — a substance added to another in relatively small amounts to impart or improve desirable properties or suppress undesirable properties.

adhesion — the state in which two surfaces are held together by interfacial effects that may consist of molecular forces, interlocking action, or both.

adhesives — the group of materials used to join or bond similar or dissimilar materials, for example, in concrete work, the epoxy resins.

adiabatic — a condition in which heat neither enters or leaves a system.

admixture — see also **chemical admixture**.

adsorbed water — water held on surfaces of a material by electrochemical forces and having physical properties substantially different from those of absorbed water

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or chemically combined water at the same temperature and pressure. (See also **adsorption**.)

adsorption — (1) development of a higher concentration of a substance at the surface of either a liquid or solid, such as cement, cement paste, or aggregates, than exists in the bulk of the medium; (2) the process by which a substance is adsorbed. (See also **adsorbed water**.)

advancing-slope grouting — a method of grouting by which the front of a mass of grout is caused to move horizontally through preplaced aggregate by use of a suitable grout injection sequence.

advancing-slope method — a method of placing concrete, as in tunnel linings, in which the face of the fresh concrete is not vertical and moves forward as concrete is placed.

aerated concrete — see **cellular concrete** and **foamed concrete**

afwillite — a mineral with composition $3CaO{\cdot}2SiO_2{\cdot}3H_2O$ occurring naturally in South Africa, Northern Ireland, and California, and artificially in some hydrated portland cement mixtures.

agent — a general term for a material that may be used either as an addition to cement or an admixture in concrete, for example, an air-entraining agent.

agglomeration — a gathering into a ball or mass.

aggregate — granular material, such as sand, gravel, crushed stone, crushed hydraulic-cement concrete, or iron blast-furnace slag, used with a cementing medium to produce either concrete or mortar. (See also **heavyweight aggregate** and **lightweight aggregate**.)

aggregate blending — the process of intermixing two or more aggregates to produce a combination with improved grading or other properties

aggregate gradation — see **grading** (preferred term).

aggregate interlock — the effect of portions of aggregate particles from one side of a joint or crack in concrete protruding into recesses in the other side of the joint or crack so as to transfer load in shear and maintain alignment.

aggregate transparency — discoloration of a concrete surface consisting of darkened areas over coarse aggregate particles immediately below the concrete surface.

aggregate-cement ratio — the ratio of total aggregate to cement, either by mass or volume.

agitating speed — the rate of rotation of the drum of a truck mixer or agitator when used for agitating mixed concrete.

agitating truck — a vehicle in which freshly mixed concrete can be conveyed from the site of mixing to the site of placement; while being agitated, the truck body can either be stationary and contain an agitator or it can be a drum rotated continuously so as to agitate the contents (also called agitating lorry in the United Kingdom).

agitation — (1) the process of providing motion in mixed concrete just sufficient to prevent segregation or loss of workability; (2) the mixing and homogenization of slurries or finely ground powders by either mechanical means or injection of air. (See also **agitator**.)

agitator — a device for maintaining workability and preventing segregation of mixed concrete by agitation. (See also **agitation**.)

air content — the volume of air voids in cement paste, mortar, or concrete, exclusive of pore space in aggregate particles, usually expressed as a percentage of total volume of the paste, mortar, or concrete.

air entraining — the capability of a material or process to develop a system of microscopic bubbles of air in cement paste, mortar, or concrete during mixing. (See also **air entrainment**.)

air entrainment — the incorporation of air in the form of microscopic bubbles (typically smaller than 1 mm [0.04 in.]) during the mixing of either concrete or mortar. (See also **air entraining** and **entrained air**.)

air lift — equipment whereby slurry or dry powder is lifted through pipes by means of compressed air.

air meter — a device for measuring the air content of concrete and mortar.

air ring — perforated manifold in nozzle of wet-mix shotcrete equipment through which high-pressure air is introduced into the material flow.

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air separator — an apparatus that separates various size fractions of ground materials pneumatically; fine particles are discharged as product, oversized particles are returned to the mill as tailing.

air void — a space in cement paste, mortar, or concrete filled with air. (See also **entrained air** and **entrapped air**.)

air-blown mortar — see **shotcrete** (preferred term).

air-cooled blast-furnace slag — see **blast-furnace slag**.

air-entraining admixture — an admixture that causes the development of a system of microscopic air bubbles in concrete, mortar, or cement paste during mixing, usually to increase its workability and resistance to freezing and thawing. (See also **entrained air**.)

air-entraining agent — see **air-entraining admixture**

air-entraining hydraulic cement — hydraulic cement containing sufficient amounts of air-entraining agent to produce a cementitious mixture containing entrained air within specified limits.

air-permeability test — a procedure for measuring the fineness of powdered materials such as portland cement. (See also **Blaine test**.)

air-water jet — a high-velocity jet of air and water mixed at the nozzle, used in clean-up of surfaces of rock or concrete, such as horizontal construction joints.

alignment wire — see **ground wire** (preferred term)

alite — a form of tricalcium silicate that is the principal phase in portland-cement clinker. (See also **belite** and **celite**.)

alkali — salts of alkali metals, principally sodium and potassium; specifically sodium and potassium occurring in constituents of concrete and mortar, usually expressed in chemical analyses as the oxides Na_2O and K_2O. (See also **low-alkali cement**.)

alkali reactivity (of aggregate) — susceptibility of aggregate to alkali-aggregate reaction.

alkali-aggregate reaction — chemical reaction in either mortar or concrete between alkalies (sodium and potassium) from portland cement or other sources and certain constituents of some aggregates.

alkali-carbonate rock reaction — the reaction between the alkalies (sodium and potassium) in portland cement and certain carbonate rocks, particularly calcitic dolomite and dolomitic limestones, present in some aggregates.

alkali-silica reaction — the reaction between the alkalies (sodium and potassium) in portland cement and certain siliceous rocks or minerals, such as opaline chert, strained quartz, and acidic volcanic glass, present in some aggregates.

alkyl aryl sulfonate — synthetic detergent used to entrain air in hydraulic-cement mixtures.

allowable bearing capacity — the maximum pressure to which a soil or other material should be subjected to guard against shear failure or excessive settlement.

allowable load — see **service dead load** and **service live load**.

allowable stress — maximum permissible stress used in design of members of a structure and based on a factor of safety against rupture or yielding of any type.

alumina — aluminum oxide (Al_2O_3).

aluminate cement — see **calcium-aluminate cement**

aluminate concrete — concrete made with calcium-aluminate cement.

aluminous cement — see **calcium-aluminate cement** (preferred term)

amount of mixing — the extent of mixer action employed in combining the ingredients for either concrete or mortar; in the case of stationary mixers, the mixing time; in the case of truck mixers, the number of revolutions of the drum at mixing speed after the intermingling of the cementitious materials with water and aggregates. (See also **mixing time**.)

amplitude — the maximum displacement from the mean position in connection with vibration.

anchor — (1) in prestressed concrete, to lock the stressed tendon in position so that it will retain its stressed condition; (2) in precast-concrete construction, to attach the precast units to the building frame; (3) 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.

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anchor bolt — a metal bolt or stud, headed or threaded, cast in place, grouted in place, or drilled and fastened into existing concrete either by expansion or by chemical adhesives.

anchorage — (1) in post-tensioning, a device used to anchor the tendon to the concrete member; (2) in pretensioning, a device used to maintain the elongation of a tendon during the time interval between stressing and release; (3) in precast-concrete construction, the devices for attaching precast units to the building frame; (4) in slab or wall construction, the device used to anchor the slab or wall to the foundation, rock, or adjacent structure.

anchorage bond stress — the bar forces divided by the product of the bar perimeter or perimeters and the embedment length.

anchorage deformation — the loss of elongation or stress in the tendons of prestressed concrete due to the deformation or seating of the anchorage when the prestressing force is transferred from the jack to the anchorage (also called anchorage loss). (See also **slip**.)

anchorage device — see **anchorage** (preferred term)

anchorage loss — see **anchorage deformation**

anchorage slip — see **anchorage deformation** or **slip**.

anchorage zone — (1) in post-tensioning, the region adjacent to the anchorage subjected to secondary stresses resulting from the distribution of the prestressing force; (2) in pretensioning, the region in which the transfer bond stresses are developed.

angle of repose — the angle between the horizontal and the natural slope of loose material below which the material will not slide.

angular aggregate — aggregate particles that possess well-defined edges formed at the intersection of roughly planar faces.

anhydrite — (1) a mineral, anhydrous calcium sulfate ($CaSO_4$); (2) gypsum from which the water of crystallization has been removed, usually by heating above 325°F (160°C).

anhydrous calcium chloride ($CaCl_2$) — a solid, usually 94 percent calcium chloride, typically in pellet form.

anti-washout admixture — a concrete admixture that reduces the loss of fine material from concrete when placed in water.

apparent specific gravity — the ratio of the mass of a volume of the impermeable portion of a material at a stated temperature to the mass of an equal volume of distilled water at a stated temperature.

arc spectrography — spectrographic identification of elements in a sample of material heated to volatilization in an electric arc or spark.

architect-engineer — architect, engineer, architectural firm, engineering firm, or architectural and engineering firm issuing contract documents, administering the work under contract documents, or both (also called engineer-architect).

architectural concrete — concrete that will be permanently exposed to view and therefore requires special care in selection of the concrete materials, forming, placing, and finishing to obtain the desired architectural appearance.

area of steel — the cross-sectional area of the steel reinforcement.

arenaceous — composed primarily of sand; sandy.

argillaceous — composed primarily of clay or shale; clayey.

arris — the sharp external corner edge that is formed at the junction of two planes or surfaces.

arrissing tool — a tool similar to a float, but having a form suitable for rounding an edge of freshly placed concrete.

artificial pozzolan — materials such as fly ash and silica fume. (See also **fly ash** and **silica fume**).

asbestos-cement products — products manufactured from rigid material composed essentially of asbestos fiber and portland cement.

ashlar masonry — masonry composed of bonded blocks of concrete, either rectangular or square, always of two or more sizes.

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asphalt — a dark brown to black cementitious material in which the predominating constituents are bitumens that occur in nature or are obtained in petroleum processing.

asphalt cement — asphalt that is refined to meet specifications for use in the manufacture of bituminous pavements.

asphaltic concrete — a mixture of asphalt cement and aggregate.

atmospheric-pressure steam curing — steam curing of concrete products or cement at atmospheric pressure, usually at maximum ambient temperature between 100 to 200°F (40 to 95°C).

autoclave — a high-pressure steam vessel.

autoclave curing — curing of concrete products in an autoclave at maximum ambient temperature generally between 340 and 420°F (170 and 215°C).

autoclave cycle — (1) the time interval between the start of the temperature-rise period and the end of the blowdown period; (2) a schedule of the time and temperature-pressure conditions of periods that make up the cycle.

autoclaved — see **autoclave curing**.

autoclaving — see **autoclave curing**.

autogenous healing — a natural process of filling and sealing dormant cracks in concrete or in mortar when kept damp.

autogenous length change — length change caused by autogenous volume change. (See also **autogenous volume change**.)

autogenous shrinkage — see **autogenous volume change**.

autogenous volume change — change in volume due to the chemical process of hydration of cement, exclusive of effects of applied load and change in either thermal condition or moisture content.

automatic batcher — see **batcher**.

auxiliary reinforcement — reinforcement in addition to that required by analysis for strength.

average bond stress — the force in a bar divided by the product of the perimeter and the development length of the bar.

axle load — the portion of the gross weight of a vehicle transmitted to a structure or a roadway through wheels supporting a given axle.

axle steel — steel from carbon-steel axles for railroad cars.

axle-steel reinforcement — either plain or deformed reinforcing bars rolled from axle steel.

b/b_o — see **coarse-aggregate factor** (preferred term).

back form — see **top form** (preferred term).

back plastering — plaster applied to one face of a lath system following application and subsequent hardening of plaster applied to the opposite face. (See also **parge**.)

back stay — see **brace** (preferred term).

backfill concrete — nonstructural concrete used to over-fill excavated pockets in rock or prepare a surface to receive structural concrete. (See also **controlled low-strength material** [preferred term].)

backshores — shores left in place or shores placed snugly under a concrete slab or structural member after the original formwork and shores have been removed from a small area, without allowing the entire slab or member to deflect or support its self-weight and construction loads.

bacterial corrosion — destruction of a material by bacterial processes brought about by the activity of certain bacteria that consume the material and produce substances, such as hydrogen sulfide, ammonia, and sulfuric acid.

bag of cement — a quantity of portland cement: 94 lb (43 kg) in the United States; for other kinds of cement, a quantity indicated on the bag. (Also called sack of cement.)

balanced load — load capacity at simultaneous crushing of concrete and yielding of tension steel. (See also **load balancing**.)

balanced moment — moment capacity at simultaneous crushing of concrete and yielding of tension steel.

balanced reinforcement — (1) an amount and distribution of reinforcement in a flexural member such that in working-stress design, the allowable tensile stress in the

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steel and the allowable compressive stress in the concrete are attained simultaneously; (2) an amount and distribution of reinforcement in a flexural member such that in strength design, the tensile reinforcement reaches its specified yield strength simultaneously with the concrete in compression reaching its assumed ultimate strain of 0.003.

ball mill — horizontal, cylindrical, rotating mill charged with large grinding media.

ball test — a test to determine the consistency of freshly mixed concrete by measuring the depth of penetration of a cylindrical metal weight with a hemispherical bottom. (See also **Kelly ball**.)

bar — a long, slender structural element, normally composed of steel, used to reinforce concrete.

bar bender — (1) a tradesman who cuts and bends steel reinforcement; (2) a machine for bending steel reinforcement.

bar mat — see **mat** (1).

bar schedule — a list of the reinforcement showing the shape, number, size, and dimensions of every different element required for a structure or a portion of a structure.

bar spacing — the distance between parallel reinforcing bars, measured center to center of the bars perpendicular to their longitudinal axes.

bar support — hardware used to support or hold reinforcing bars in proper position to prevent displacement before and during concrete placement. (See also **slab bolster**.)

bar-end check — a check of the ends of reinforcing bars to determine whether they fit the devices intended for connecting the bars. (See also **mechanical connection**.)

barite — a mineral, barium sulfate ($BaSO_4$), used in either pure or impure form as concrete aggregate primarily for the construction of high-density radiation shielding concrete (also called barytes in the United Kingdom).

barrel (of cement) — (obsolete) a quantity of portland cement: four bags or 376 lb in the United States.

base — (1) a subfloor slab or working mat, either previously placed and hardened or freshly placed, on which floor topping is placed in a later operation; (2) the underlying stratum on which a concrete slab, such as a pavement, is placed. (See also **mud mat** and **subbase**.)

base bead — see **base screed** (preferred term).

base coat — any plaster coat or coats applied before application of the finish coat.

base course — (1) a layer of specified select material of planned thickness constructed on the subgrade or subbase of a pavement to serve one or more functions, such as distributing loads, providing drainage, or minimizing frost action; (2) the lowest course of masonry in a wall or pier.

base plate — a metallic plate, typically steel, used to distribute forces and moments.

base screed — a preformed metal screed with perforated or expanded flanges to provide a guide for thickness and planeness of plaster and to provide a separation between plaster and other materials.

basic creep — creep that occurs without migration of moisture to or from the concrete. (See also **creep** and **drying creep**.)

bassanite — calcium sulfate hemihydrate, $2CaSO_4 \cdot H_2O$. (See also **hemihydrate** and **plaster of paris**.)

batch — (1) quantity of material mixed at one time or in one continuous process; (2) to weigh or volumetrically measure and introduce into the mixer the ingredients for a quantity of material.

batch mixer — a machine that mixes batches of either concrete or mortar.

batch plant — an installation for batching or for batching and mixing concrete materials.

batch weights — the quantities of the various ingredients (cement, water, the several sizes of aggregate, and admixtures, if used) that compose a batch of concrete.

batched water — see **mixing water**.

batcher — a device for measuring ingredients for a batch of concrete. (1) *manual batcher* — a batcher equipped with gates or valves that are

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operated manually, with or without supplementary power (pneumatic, hydraulic, or electrical), the accuracy of the weighing operation being dependent on the operator's observation of the scale.
(2) *semiautomatic batcher* — a batcher equipped with gates or valves that are separately opened manually to allow the material to be weighed but that are closed automatically when the designated quantity of each material has been reached.
(3) *automatic batcher* — a batcher equipped with gates or valves that, when actuated by a single starter switch, will open automatically at the start of the weighing operation of each material and close automatically when the designated quantity of each material has been reached, interlocked in such a manner that: (a) the charging mechanism cannot be opened until the scale has returned to zero; (b) the charging mechanism cannot be opened if the discharge mechanism is open; (c) the discharge mechanism cannot be opened if the charging mechanism is open; (d) the discharge mechanism cannot be opened until the designated quantity has been reached within the allowable tolerance; and (e) if different kinds of aggregates or different kinds of cements are measured cumulatively in a single batcher, interlocked sequential controls are provided.

batten — a narrow strip of wood placed over the vertical joint of sheathing or paneling; also used to hold several boards together (also called batten strip). (See also **cleat**.)

batter pile — a pile installed at an angle to the vertical.

bauxite — a rock composed principally of hydrous aluminum oxides that is the principal ore of aluminum and a raw material for manufacture of calcium-aluminate cement.

bay — (1) the space, in plan, between the centerlines of adjacent piers, mullions, or columns; (2) a small, well-defined area of concrete placed at one time in the course of placing large areas, such as floors, pavements, or runways.

beam — a structural member subjected primarily to flexure but may also be subjected to axial load. (See also **spandrel beam**, **girder**, **joist**, **ledger**, and **stringer**.)

beam bottom — soffit or bottom form for a beam.

beam pocket — (1) opening left in a vertical member in which a beam is to rest; (2) an opening in the column or girder form where forms for an intersecting beam will be framed.

beam test — a method of measuring the flexural strength (modulus of rupture) of concrete by testing a standard unreinforced beam.

beam-column — a structural member subjected to axial load and bending moment.

bearing capacity — see **allowable bearing capacity**.

bearing stratum — the soil or rock stratum on which a concrete footing or mat bears or that carries the load transferred to it by a concrete pile, caisson, or similar deep foundation unit.

belite — a form of dicalcium silicate that occurs as a phase in portland-cement clinker. (See also **alite** and **celite**.)

belled pier — a drilled pier shaft with an enlarged base.

bending moment — the bending effect at any section of a structural element equal to the algebraic sum of the moments of the vertical and horizontal forces, with respect to the centroidal axis of a member, acting on a freebody of the member.

bending-moment diagram — a graphical representation of the variation of bending moment along the length of the member for a given stationary system of loads.

beneficiation — improvement of the chemical or physical properties of a raw material or intermediate product by the removal or modification of undesirable components or impurities.

bent bar — a reinforcing bar bent to a prescribed shape. (See also **hook**, **hooked bar**, **stirrup**, and **tie**.)

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bentonite — a clay composed principally of minerals of the montmorillonoid group, characterized by high adsorption and large volume change with wetting or drying.

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

binary mixture — concrete containing two cementitious materials.

binder — (1) material forming the matrix of concretes, mortars, and sanded grouts; (2) chemical treatment applied to fibers to give integrity to mats, roving, and reinforcement.

biological shielding — shielding provided to attenuate or absorb nuclear radiation, such as neutron, proton, alpha, and beta particles, and gamma radiation; the shielding is provided mainly by the density of the concrete, except that in the case of neutrons, the attenuation is achieved by compounds of some of the lighter elements (for example, hydrogen and boron). (See also **shielding concrete**.)

bituminous cement — a black solid, semisolid, or liquid substance at natural air temperatures and appreciably soluble only in carbon disulfide or some volatile liquid hydrocarbon, being composed of mixed indeterminate hydrocarbons mined from natural deposits, produced as a residue in the distillation of petroleum, or obtained by the destructive distillation of coal or wood.

Blaine apparatus — air-permeability apparatus for measuring the surface area of a finely ground cement, raw material, or other product. See ASTM C204.

Blaine fineness — the fineness of powdered materials such as cement and pozzolans, expressed as surface area per unit mass usually in square meters per kilogram, determined by the Blaine apparatus. (See also **specific surface**.)

Blaine test — a method for determining the fineness of cement or other fine material on the basis of the permeability to air of a sample prepared under specified conditions.

blast-furnace slag — the nonmetallic product consisting essentially of silicates and aluminosilicates of calcium and other bases that develops in a molten condition simultaneously with iron in a blast furnace.
(1) *air-cooled blast-furnace slag* — the material resulting from solidification of molten blast-furnace slag under atmospheric conditions; subsequent cooling may be accelerated by application of water to the solidified surface.
(2) *expanded blast-furnace slag* — the low density cellular material obtained by controlled processing of molten blast-furnace slag with water, or water and other agents, such as steam, compressed air, or both.
(3) *granulated blast-furnace slag* — the glassy, granular material formed when molten blast-furnace slag is rapidly chilled, as by immersion in water.
(4) *ground-granulated blast-furnace slag* — (obsolete) see **slag cement** (preferred term).

bleed — to undergo bleeding. (See also **bleeding**.)

bleeding — the autogenous flow of mixing water within, or its emergence from, a newly placed cementitious mixture caused by the settlement of solid materials within the mass.

bleeding capacity — the ratio of volume of water released by bleeding to the volume of paste or mortar.

bleeding rate — the rate at which water is released from a paste or mortar by bleeding.

blemish — any superficial defect that causes visible variation from a consistently smooth and uniformly colored surface of hardened concrete. (See also **bug holes**, **efflorescence**, **honeycomb**, **lift joint**, **laitance**, **popout**, **rock pocket**, and **sand streak**.)

blended cement — a hydraulic cement consisting of portland cement uniformly mixed with slag cement or pozzolan, or both.

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blinding — the filling or plugging of the openings in a screen or sieve by the material being separated.

blistering — (1) the irregular raising of a thin layer at the surface of a placed cementitious mixture during or soon after completion of the finishing operation, or, in the case of pipe, after spinning; (2) bulging of a finish coat as it separates and draws away from a base coat.

block beam — a flexural member composed of individual blocks that are joined together by prestressing.

blockout — a space within a concrete structure under construction in which fresh concrete is not to be placed, called core in United Kingdom.

blowholes — see **surface air voids** (preferred term).

blowpipe — air jet used in shotcrete gunning to remove rebound or other loose material from the work area.

blowup — the raising of two concrete slabs off the subgrade where they meet as a result of greater expansion than the joint between them will accommodate; typically occurs only in unusually hot weather where joints have become filled with incompressible material; often results in cracks on both sides of the joint and parallel to it.

board butt joint — construction joint in shotcrete formed by sloping the sprayed surface to a 1 in. (25 mm) board laid flat.

bolt sleeve — a tube surrounding a bolt in a concrete wall to prevent concrete from adhering to the bolt and acting as a spreader for the formwork.

bond — (1) adhesion of concrete or mortar to reinforcement or other surfaces against which it is placed, including friction and mechanical interlock; (2) adhesion of cement paste to aggregate; (3) adhesion, cohesion, or both between materials; (4) patterns formed by the exposed faces of masonry units, for example, running bond or Flemish bond.

bond area — the nominal area of interface between two elements across which adhesion, cohesion, or both, develop(s) or may develop, as between cement paste and aggregate.

bond breaker — a material used to prevent adhesion of newly placed concrete to the substrate. (See also **form oil** and **release agent**.)

bond length — see **development length** (preferred term).

bond plaster — a specially formulated gypsum plaster designed as first-coat application over monolithic concrete.

bond prevention — measures taken to prevent adhesion of concrete or mortar to surfaces against which it is placed.

bond strength — (1) resistance to separation of mortar and concrete from reinforcing and other materials with which it is in contact; (2) a collective expression for forces such as adhesion, friction due to shrinkage, and longitudinal shear in the concrete engaged by the bar deformations that resist separation.

bond stress — (1) the force of adhesion per unit area of contact between two bonded surfaces, such as concrete and reinforcing steel, or any other material, such as foundation rock; (2) shear stress at the surface of a reinforcing bar, preventing relative movement between the bar and the surrounding concrete when the bar carries tensile force.

bonded hollow-wall masonry — a cavity wall, built of masonry units, in which the inner and outer walls are tied together by bonders.

bonded member — a prestressed concrete member in which the tendons are bonded to the concrete either directly or through grouting.

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.

bonded tendon — a prestressing tendon that is bonded to the concrete either directly or through grouting.

bonder — a masonry unit that ties two or more wythes (leaves) of a wall together by overlapping. (See also **header** and **wythe [leaf]**.)

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bonding agent — a substance applied to a suitable substrate to create a bond between it and a succeeding layer.

bonding layer — a layer of mortar, usually 1/8 to 1/2 in. (3 to 13 mm) thick, which is spread on a moist and prepared hardened concrete surface before placing fresh concrete.

bored pile — see **drilled pier**.

boring — (1) the removal of a sample by drilling of rock; (2) a generic name for cylindrical sample of soil or rock.

boron frits — clear, colorless, synthetic glass produced by fusion and quenching, containing boron. (See also **boron-loaded concrete**.)

boron-loaded concrete — high density concrete including a boron-containing admixture or aggregate, such as the mineral colemanite, boron frits, or boron metal alloys, to act as a neutron attenuator. (See also **biological shielding** and **shielding concrete**.)

box out — a formed opening in concrete (also called a boxout).

brace — a structural member used to provide lateral support for another member, generally for the purpose of ensuring stability or resisting lateral loads.

bracing — see **brace** (preferred term).

bracket — (1) an overhanging member projecting from a wall or other body to support weight acting outside the wall; (2) formed shapes of channel or pencil rod used as structural reinforcement in erecting furred assemblies. (See also **corbel**.)

bredigite — a mineral, alpha prime dicalcium silicate ($2CaO \cdot SiO_2$), occurring in slags and portland cement.

breeze — (1) usually clinker; (2) fine divided material from coke production.

brick seat — ledge on wall or footing to support a course of masonry.

bridge deck — the structural concrete slab or other structure that is supported on the bridge superstructure and serves as the roadway or other traveled surface.

briquette — a molded specimen of mortar with enlarged extremities and reduced center having a cross section of definite area, used for measurement of tensile strength (also called a briquet).

broadcast — to toss granular material, such as sand, over a horizontal surface so that a thin, uniform layer is obtained.

broom finish — the surface texture obtained by stroking a broom over freshly placed concrete.

brown coat — the leveling coat of plaster, either the second coat of plaster in a three-coat application or the entire base coat of plaster in a two-coat application.

brown out — to complete application of base coat plaster.

brownmillerite — a ternary compound originally regarded as $4CaO \cdot Al_2O \cdot Fe_2O_3$ (C_4AF) occurring in portland and calcium-aluminate cement, now used to refer to a series of solid solutions between $2CaO \cdot Fe_2O_3$ (C_2F) and $2CaO \cdot Al_2O_3$ (C_2A).

brucite — a mineral having the composition magnesium hydroxide, $Mg(OH)_2$, and a specific crystal structure.

buckling — lateral or torsional instability of a structural member.

bug holes — see **surface air voids** (preferred term).

buggy — a two-wheeled hand- or motor-driven cart (usually rubber-tired) for transporting small quantities of concrete from hoppers or mixers to forms (also called a concrete cart).

building official — (1) the official charged with administration and enforcement of the applicable building code; (2) the duly authorized representative of the official.

build-up — (1) spraying of shotcrete in successive layers to form a thicker mass; (2) the accumulation of residual hardened concrete in a mixer.

bulk cement — cement that is transported and delivered in bulk (usually in specially constructed vehicles) instead of in bags.

bulk density — the mass of a material per unit volume including voids between particles.

bulk specific gravity — (obsolete) see **oven-dry specific gravity** (preferred term).

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bulkhead — (1) a partition in formwork blocking fresh concrete from a section of the form, or a partition closing a section of the form, such as at a construction joint; (2) a partition in a storage tank or bin, as for cement or aggregate.

bulking — increase in the volume occupied by a quantity of sand in a moist condition over the volume of the same quantity dry or completely inundated.

bulking factor — ratio of the volume of moist sand to the volume of the sand when dry.

bull float — a tool comprising a large, flat, rectangular piece of wood, aluminum, or magnesium usually 8 in. (200 mm) wide and 42 to 60 in. (1 to 1.50 m) long, and a handle 4 to 16 ft (1 to 5 m) in length used to smooth unformed surfaces of freshly placed concrete.

bundled bars — a group of not more than four parallel reinforcing bars in contact with each other, usually tied together.

burlap — a coarse fabric of jute, hemp, or less commonly flax for use as a water-retaining covering in curing concrete surfaces (also called Hessian).

burnishing — (1) to hard trowel the surface of concrete or plaster up to time of final setting; (2) to otherwise produce a smooth surface.

bush hammer — (1) a hammer having a serrated face, as rows of pyramidal points used to roughen or dress a surface; (2) to finish a concrete surface by application of a bush hammer.

butt joint — a plain square joint between two members.

butter — (1) to spread mortar on a masonry unit with a trowel; (2) the process by which the interior of a concrete mixer, transportation unit, or other item coming in contact with fresh concrete is provided with a mortar coating so that fresh concrete coming in contact with it will not be depleted of mortar.

buttress — a projecting structure to support either a wall or a building.

butyl stearate — a colorless, oily, and practically odorless material ($C_{17}H_{35}COOC_4H_9$) used as an admixture for concrete to provide dampproofing.

cable — see **tendon** (preferred term).

cage — a rigid assembly of reinforcement ready for placing in position.

caisson — part of a foundation, a watertight chamber used in construction underwater, or a hollow floating box used as a floodgate for a dock or basin.

calcareous — containing calcium carbonate or, less generally, containing the element calcium.

calcine — to alter composition or physical state by heating below the temperature of fusion.

calcite — (1) a mineral having the composition calcium carbonate ($CaCO_3$) and a specific crystal structure; (2) the principal constituent of limestone, chalk, and marble; (3) a major constituent in the manufacture of portland cement.

calcium — a silver-white metallic element of the alkaline-earth group occurring naturally only in combination with other elements.

calcium sulfoaluminate cement — product obtained by pulverizing clinker containing mainly ye′elimite [$Ca_4(AlO_2)_6SO_4$] that are often used in expansive cements and ultra-high early strength cements; hydration produces ettringite, with expansion or rapid hydration obtained by adjustment of the availability of calcium and sulfate ions.

calcium chloride — $CaCl_2$, a crystalline solid, is primarily used in concrete as an accelerating admixture. (See also **accelerating admixture**.)

calcium chloride solution — an aqueous solution of calcium.

calcium hydroxide — see **hydrated lime**.

calcium stearate — $Ca(C_{18}H_{35}O_2)_2$, commonly marketed in powder form, insoluble in water, used as a water repellent admixture in concrete.

calcium-aluminate cement — the product obtained by pulverizing clinker consisting essentially of hydraulic calcium aluminates resulting from fusing or sintering a suitably proportioned mixture of aluminous and calcareous materials (called high-alumina cement in the United Kingdom).

calcium-silicate brick — a concrete product made principally from sand and lime that is hardened by autoclave curing.

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calcium-silicate hydrate — the primary product of silicate reactions that contribute to concrete strength and density. (See also **dicalcium silicate** and **tricalcium silicate**.)

caliche — gravel, sand, and desert debris cemented by calcium carbonate or other salts.

California bearing ratio (CBR) — a method to determine the load-bearing capacity of soil.

calorimeter — an instrument for measuring heat exchange during a chemical reaction, such as the quantity of heat liberated by the combustion of a fuel or hydration of a cement.

camber — a deflection that is intentionally built into a structural element or form to improve appearance or to compensate for the deflection of the element under the effects of loads, shrinkage, and creep.

canister-type anchor bolt — anchorage assembly that includes a sleeve, a threaded rod, and means of removing the rod and adjusting rod location, projection, and tension.

cant strip — see **chamfer strip** (preferred term).

cap — a smooth, plane surface of suitable material bonded to the bearing surfaces of test specimens to distribute the load during strength testing.

capacity — (1) a measure of the rated volume of a particular concrete mixer or agitator, usually limited by specifications to a maximum percentage of total gross volume; (2) the output of concrete, aggregate, or other product per unit of time (as plant capacity or screen capacity); (3) load-carrying limit of a structure.

capacity-reduction factor — see **nominal strength-reduction factor** (preferred term).

capillarity — the movement of a liquid in the interstices of concrete, soil, or other finely porous material due to surface tension (also called capillary rise, capillary action, or capillary suction).

capillary action — see **capillarity**.

capillary pores — microscopic channels within hydrated paste that will draw liquid water due to surface tension.

capillary rise — see **capillarity**.

capillary suction — see **capillarity**.

carbon black — a finely divided form of carbon produced by the combustion or partial decomposition of hydrocarbon, used as an admixture to color concrete.

carbonation — (1) reaction between carbon dioxide and a hydroxide or oxide to form a carbonate, especially in cement paste, mortar, or concrete; (2) the reaction with calcium compounds to produce calcium carbonate.

carbonation shrinkage — shrinkage resulting from carbonation.

cast stone — concrete or mortar cast into blocks or small slabs in special molds so as to resemble natural building stone.

castable refractory — a packaged dry mixture of hydraulic cement, generally calcium-aluminate cement, and specially selected and proportioned refractory aggregates that, when mixed with water, will produce refractory concrete or mortar.

cast-in-place concrete — concrete that is deposited and allowed to harden in the place where it is required to be in the completed structure, as opposed to precast concrete.

cast-in-place pile — a concrete pile that is cast with or without a casing in its permanent location, as distinguished from a precast pile. (See also **drilled pier** and **precast pile**.)

cast-in-situ — see **cast-in-place concrete** (preferred term).

cathead — (1) a notched wedge placed between two formwork members meeting at an oblique angle; (2) a spindle on a hoist; (3) the large, round retention nut used on she bolts.

cathodic protection — the form of corrosion protection wherein one metal is caused to corrode in preference to another, thereby protecting the latter from corrosion.

caulk — to place a material in a crack or joint with the intent of retarding entry of dirt or water. (See also **joint filler** or **joint sealant**.)

cavitation damage — pitting of concrete caused by implosion, that is, the collapse of vapor bubbles in flowing water that form in areas of low pressure and collapse as they enter areas of higher pressure. (See also **abrasion damage** and **erosion**.)

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celite — a name used to identify the calcium aluminoferrite constituent of portland cement. (See also **alite** and **belite**.)

cellular concrete — a low-density product consisting of portland cement, cement-silica, cement-pozzolan, lime-pozzolan, or lime-silica pastes, or pastes containing blends of these ingredients and having a homogeneous void or cell structure, attained with gas-forming chemicals or foaming agents.

cellular construction — a method of cast-in-place concrete construction where a large ratio of hollow cores is produced in a flat slab.

cement — any of a number of materials that are capable of binding aggregate particles together. (See also **hydraulic cement**.)

cement bacillus — see **ettringite** (preferred term).

cement content — quantity of cement contained in a concrete, mortar, or grout preferably expressed as mass per unit volume of concrete, mortar, or grout.

cement factor — see **cement content** (preferred term).

cement gel — the colloidal material that makes up the major portion of the porous mass of which mature hydrated cement paste is composed.

cement gun — a machine for pneumatic placement of mortar or small aggregate concrete. (See also **shotcrete**.)

cement paint — a paint consisting generally of white portland cement and water, pigments, hydrated lime, water repellents, or hygroscopic salts.

cement paste — binder of concrete and mortar consisting essentially of cement, water, hydration products, and any admixtures together with very finely divided materials included in the aggregates. (See also **neat cement paste**.)

cement plaster — see **plaster** and **stucco**.

cement rock — natural impure limestone that contains the ingredients for production of portland cement in approximately the required proportions.

cementation process — the process of injecting cement grout under pressure into certain types of ground (for example, gravel, fractured rock) to solidify it.

cement-bound macadam — a road consisting of crushed stone, crushed slag, or gravel and either a grout or mortar filler.

cementitious — having cementing properties.

cementitious materials — pozzolans and hydraulic cements. (See also **fly ash**, **silica fume**, and **slag cement**.)

cementitious mixture — a mixture (mortar, concrete, or grout) containing hydraulic cement.

centering — falsework used in the construction of arches, shells, space structures, or any continuous structure where the entire falsework is lowered (struck or decentered) as a unit. (See also **falsework** and **formwork**.)

central mixer — a stationary concrete mixer from which the freshly mixed concrete is transported to the work.

central-mixed concrete — concrete that is completely mixed in a stationary mixer from which it is transported to the delivery point.

centrifugal process — a process for producing concrete products, such as pipe, that uses an outer form that is rotated about a horizontal axis and into which concrete is fed by a conveyor, also called spinning process. (See also **centrifugally cast concrete**, **dry-cast process**, **packerhead process**, **tamp process**, and **wet-cast process**.)

centrifugally cast concrete — concrete compacted by centrifugal action, for example, in the manufacture of pipe and poles. (See also **centrifugal process**.)

ceramic bond — bond that is the result of thermo-chemical reactions between materials exposed to temperatures approaching the fusion point of the mixture.

chair — see **bar support** (preferred term).

chalk — a soft limestone composed primarily of the calcareous remains of marine organisms.

chalking — formation of a loose powder resulting from the disintegration of the surface of concrete or of applied coating, such as cement paint.

chamfer — either a beveled edge or corner formed in concrete work by means of a chamfer strip.

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chamfer strip — either a triangular or curved insert placed in an inside form corner to produce either a rounded or flat chamfer or to form a rustication (also called a cant strip, fillet, dummy joint, and skew back).

charge — to introduce, feed, or load materials into a concrete or mortar mixer, furnace, or other container or receptacle where they will be further treated or processed.

checking — development of shallow cracks at closely spaced but irregular intervals on the surface of plaster, cement paste, mortar, or concrete. (See also **crack** and **crazing**.)

chemical admixture — a liquid, or dispersible powder, used as an ingredient in a cementitious mixture to improve its economy and/or properties in the plastic and/or hardened state.

chemical attack of concrete — the alteration or deterioration of concrete through chemical reaction or just presence of chemicals with either the cement paste, coarse aggregate, or embedded steel reinforcement.

chemical bond — bond between materials that is the result of cohesion and adhesion developed by chemical reaction.

chemically prestressing cement — a type of expansive cement containing a higher percentage of expansive component than a shrinkage-compensating cement, when used in concretes with adequate internal or external restraint, that will expand sufficiently due to chemical reactions within the matrix to develop the stresses necessary for prestressing the concrete.

chert — a very fine-grained siliceous rock characterized by hardness and conchoidal fracture in dense varieties, the fracture becoming splintery and the hardness decreasing in porous varieties and in a variety of colors; composed of silica in the form of chalcedony, cryptocrystalline or microcrystalline quartz, opal, or a combination of any of these minerals.

chipping — treatment of a hardened concrete surface by chiseling.

chips — broken fragments of marble or other mineral aggregate screened to specified sizes.

chute — a sloping trough or tube for conducting concrete, cement, aggregate, or other free-flowing materials from a higher to a lower point.

clamp — see **coupler** (preferred term).

class (of concrete) — an arbitrary characterization of concrete of various qualities or usages, usually by compressive strength.

classifier — machine for separating coarse and fine particles of granular material.

clay — natural mineral material having plastic properties and composed of very fine particles; the clay mineral fraction of a soil is usually considered to be the portion consisting of particles finer than 2 μm; clay minerals are essentially hydrous aluminum silicates or occasionally hydrous magnesium silicates.

clay content — mass fraction of clay of a heterogeneous material such as a soil or a natural concrete aggregate or crushed stone.

cleanout — (1) an opening in the forms for removal of refuse to be closed before the concrete is placed; (2) a port in tanks, bins, or other receptacles for inspection and cleaning.

cleanup — treatment of horizontal construction joints to remove surface material and contamination down to a condition of soundness corresponding to that of a freshly broken surface of hardened concrete.

cleat — small board used to connect formwork members or used as a brace. (See also **batten**.)

climbing form — a form that is raised vertically for succeeding lifts of concrete in a given structure.

clinker — a partially fused product of a kiln, which is ground to make cement; also other vitrified or burnt material. (See also **portland-cement clinker**.)

clip — wire or sheet-metal device used to attach various types of lath to supports or to secure adjacent lath sheets.

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coarse aggregate — aggregate predominantly retained on the 4.75 mm (No. 4) sieve or that portion retained on the 4.75 mm (No. 4) sieve.

coarse-aggregate factor — the ratio, expressed as a decimal, of the amount (mass or solid volume) of coarse aggregate in a unit volume of well-proportioned concrete to the amount of dry-rodded coarse aggregate compacted into the same volume (b/b_o).

coarse-grained soil — soil in which the larger grain sizes, such as sand and gravel, predominate.

coat — a film or layer as of paint or plaster applied in a single operation.

coated bar — a bar on which a coating has been applied, usually to increase resistance to corrosion.

coating — (1) *(on concrete)* — material applied to a surface by brushing, dipping, mopping, spraying, troweling, etc., to preserve, protect, decorate, seal, or smooth the substrate.
(2) *(on aggregate particles)* — foreign or deleterious substances found adhering to the aggregate particles.
(3) *(on architectural concrete)* — material used to protect a concrete surface from atmospheric contaminants and those that penetrate slightly and leave a visible clear or pigmented film on the surface. (See also **sealer**.)

cobble — in geology, a rock fragment between 2-1/2 and 10 in. (64 and 256 mm) in diameter; as applied to coarse aggregate for concrete, the material in the nominal size range 3 to 6 in. (75 to 150 mm).

cobblestone — a rock fragment, usually rounded or semirounded, with an average dimension between 3 and 12 in. (75 and 300 mm).

coefficient of permeability to water — the rate of discharge of water under laminar flow conditions through a unit cross-sectional area of a porous medium under a unit hydraulic gradient and standard temperature conditions, usually 20°C (68°F).

coefficient of subgrade friction — the coefficient of friction between a slab and its subgrade, commonly used in design of slabs-on-grade to estimate the force induced in the slab due to volume changes and elastic shortening if prestressed.

coefficient of subgrade reaction — ratio of the load per unit area of soil to the corresponding settlement of the soil, typically evaluated in place per ASTM D1196 (also called modulus of subgrade reaction).

coefficient of thermal expansion — change in linear dimension per unit length per degree of temperature change.

coefficient of variation — the standard deviation divided by the mean value of a variable.

cold joint — a joint or discontinuity resulting from a delay in placement of sufficient duration to preclude intermingling and bonding of the material, or where mortar or plaster rejoin or meet.

cold strength — the compressive or flexural strength of refractory concrete determined before drying or firing.

cold weather — a period when the average daily ambient temperature is below 40°F (5°C) for more than 3 successive days.
Note: The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. When temperatures above 50°F (10°C) occur during more than half of any 24-hour duration, the period shall no longer be regarded as cold weather.

cold-drawn wire — wire made from rods that are hot-rolled from billets and then cold-drawn through dies. (See also **cold-drawn wire reinforcement**.)

cold-drawn wire reinforcement — steel wire made from rods that have been hot rolled from billets and cold-drawn through a die.

cold-joint lines — visible lines on the surfaces of formed concrete indicating the presence of discontinuities where one layer of concrete had reached final set before subsequent concrete was placed. (See also **cold joint**.)

cold-worked steel reinforcement — steel bars or wires that have been rolled, twisted, or drawn at normal ambient temperatures.

colemanite — a mineral, hydrated calcium borate ($Ca_2B_6O_{11} \cdot 5H_2O$). (See also **boron-loaded concrete**.)

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collated fiber — fibers bundled together either by cross linking or by chemical or mechanical means.

colloidal grout — grout in which a substantial proportion of the solid particles have the size range of a colloid.

colloidal mixer — a mixer designed to produce colloidal grout.

color hardener — similar to traditional one-component hardeners, having additional constituent materials formulated to color the concrete surface.

colorimetric value — an indication of the amount of organic impurities present in fine aggregate.

column — member with a ratio of height-to-least-lateral-dimension exceeding 3 used primarily to support axial compressive load.

column capital — an enlargement of a column below a slab intended to increase the shearing resistance.

column clamp — any of various types of tying or fastening units to hold column form sides together.

column side — one of the vertical panel components of a column form.

column strip — the portion of a flat slab over the columns and consisting of the two adjacent quarter panels on each side of the column center line.

combined footing — a structural unit or assembly of units supporting more than one column.

combined-aggregate grading — particle-size distribution of a mixture of fine and coarse aggregate.

come-along — (1) a hoe-like tool with a blade approximately 4 in. (100 mm) high and 20 in. (500 mm) wide and curved from top to bottom, used for spreading concrete; (2) a colloquial name for a device (load binder) used to tighten chains holding loads in place on a truck bed.

compacted strand — prestressing strand that is drawn through a circular die to deform the wires and produce a strand with a smaller circular shape.

compacting factor — the ratio obtained by dividing the observed mass of concrete that fills a container of standard size and shape when allowed to fall into it under standard conditions of test by the mass of fully compacted concrete that fills the same container.

compaction — the process of reducing the volume of voids in a material such as soil by input of mechanical energy. (See also **consolidation**.)

composite — engineering materials made from two or more constituent materials that remain distinct but combine to form materials with properties not possessed by any of the constituent materials individually.

composite column — a concrete compression member reinforced longitudinally with structural steel shapes, pipe, or tubing with or without longitudinal reinforcing bars.

composite concrete flexural members — concrete flexural members consisting of concrete elements constructed in separate placements but so interconnected that the elements respond to loads as a unit.

composite construction — a type of construction using members produced by combining different materials (for example, concrete and structural steel), members produced by combining cast-in-place and precast concrete, or cast-in-place concrete elements constructed in separate placements but so interconnected that the combined components act together as a single member and respond to loads as a unit.

composite pile — a pile made up of different materials, usually concrete and wood, or steel fastened together end to end, to form a single pile.

composite sample — sample obtained by blending two or more individual samples of a material.

compression flange — the widened portion of an I, T, or similar cross-sectional beam that is compressed by bending under normal loads.

compression member — any member in which the primary stress is longitudinal compression.

compression reinforcement — reinforcement designed to carry compressive stresses. (See also **stress**.)

compression test — test made on a test specimen of mortar or concrete to determine the compressive strength.

concentric tendons — tendons following a line coincident with the gravity axis of the prestressed concrete member.

concordant tendon — a tendon with a profile that does not produce secondary moments and support reactions due to the prestressing force.

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concrete — mixture of hydraulic cement, aggregates, and water, with or without admixtures, fibers, or other cementitious materials.

concrete block — a concrete masonry unit, usually containing hollow cores.

concrete breakout failure — a concrete failure mode that develops a cone or edge failure of the test member due to setting of the anchor or to applied loads.

concrete brick — solid concrete masonry units of relatively small prescribed dimensions.

concrete cart — see **buggy**.

concrete compressive strength — the measured maximum resistance of a concrete specimen to axial compressive loading and expressed as force per unit cross sectional area.

concrete containment structure — a composite concrete and steel assembly that is designed as an integral part of a pressure retaining barrier that, in an emergency, prevents the release of radioactive or hazardous effluents from nuclear power plant equipment enclosed therein.

concrete dye — similar to traditional one-component hardeners, having additional constituent materials formulated to color the concrete surface.

concrete finishing machine — (1) a machine mounted on flanged wheels that ride on forms or on specially set tracks, used to finish surfaces such as those of pavements; (2) a portable power-driven machine for floating and finishing of floors and other slabs.

concrete flatwork — a general term applicable to concrete floors and slabs that require finishing operations.

concrete masonry unit — either a hollow or solid unit (block) composed of portland-cement concrete.

concrete paver — (1) a slipforming machine that places concrete pavement on the subgrade; (2) precast-concrete paving brick.

concrete pile — see **cast-in-place pile** and **precast pile**.

concrete producer — the person, firm, or entity responsible for producing and delivering concrete for the work.

concrete pryout strength — the strength corresponding to formation of concrete spall behind short, stiff anchors displaced in the direction opposite to the applied shear force.

concrete pump — an apparatus that forces concrete to the placing position through a pipeline or hose.

concrete reactor vessel — a composite concrete and steel assembly that functions as a component of the principal pressure-containing barrier for the nuclear fuel's primary heat extraction fluid (primary coolant).

concrete spreader — a machine, usually carried on side forms or on rails parallel thereto, designed to spread concrete from heaps already dumped in front of it, or to receive and spread concrete in a uniform layer.

concrete strength — see **concrete compressive strength**, **fatigue strength**, **flexural strength**, **shear strength**, **splitting tensile strength**, **tensile strength**, and **ultimate strength**

concrete vibrating machine — a machine that consolidates a layer of freshly mixed concrete by vibration.

condensed silica fume — see **silica fume** (preferred term).

cone bolt — a type of tie rod for wall forms with cones at each end inside the forms so that a bolt can act as a spreader as well as a tie.

confined concrete — concrete within the reinforcement cage.

confined region — region with transverse reinforcement within beam-column joints.

consistency — the degree to which a freshly mixed concrete, mortar, grout, or cement paste resists deformation. (See also **normal consistency**, **plastic consistency**, and **wettest stable consistency**.)

consistency factor — a measure of grout fluidity, roughly analogous to viscosity, which describes the ease with which grout may be pumped into voids or fissures; usually a laboratory measurement in which consistency is reported in degrees of rotation of a torque viscosimeter in a specimen of grout.

consistometer — an apparatus for measuring the consistency of cement pastes, mortars, grouts, or concretes.

consolidation — the process of reducing the volume of voids, air pockets, and entrapped air in a fresh cementitious mixture, usually accomplished by inputting

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mechanical energy. (See also **compaction**, **vibration**, **rodding**, and **tamping**.)

construction joint — interface between concrete placements intentionally created to facilitate construction.

construction loads — the loads to which a permanent or temporary structure is subjected during construction.

contact ceiling — a ceiling that is secured in direct contact with the construction above without use of furring.

contact pressure — pressure acting at and perpendicular to the contact area between soil and a concrete element.

contact splice — a means of connecting reinforcing bars in which the bars are lapped and in direct contact. (See also **lap splice**.)

containment structures — structures designed to be liquid-tight.

continuous beam — see **continuous slab or beam**.

continuous grading — a particle size distribution in which intermediate size fractions are present, as opposed to gap-grading. (See also **gap-graded aggregate**.)

continuous mixer — a mixer into which the ingredients of the mixture are fed without stopping, and from which the mixed product is discharged in a continuous stream.

continuous mixing — producing concrete by continuously blending ingredients in fixed proportions. The discharge of the concrete mixture may be started or stopped as required.

continuous sampling — sampling without interruptions throughout an operation or for a predetermined time.

continuous slab or beam — a slab or beam that extends as a unit over three or more supports in a given direction.

continuously reinforced pavement — a pavement with uninterrupted longitudinal steel reinforcement and no intermediate transverse expansion or contraction joints.

contract documents — a set of documents supplied by the owner to the contractor as the basis for construction. These documents contain contract forms, contract conditions, specifications, drawings, addenda, and contract changes.

contraction joint — formed, sawed, or tooled groove in a concrete structure to create a weakened plane to regulate the location of cracking resulting from the dimensional change of different parts of the structure. (See also **isolation joint, expansion joint,** and **construction joint**.)

contraction-joint grouting — injection of grout into contraction joints.

contractor — the person, firm, or corporation with whom the owner enters into an agreement for construction of the work.

control joint — formed, sawed, or tooled groove in a concrete structure to create a weakened plane to regulate the location of cracking resulting from the dimensional reduction of adjacent sections of the structure.

controlled low-strength material (CLSM) — self-consolidating cementitious mixture that is intended to result in a compressive strength of 1200 psi (8.3 MPa) or less.

conveying hose — see **delivery hose** (preferred term).

conveyor — a device for moving materials, usually a continuous belt, an articulated system of buckets, a confined screw, or a pipe through which material is moved by air or water.

coping — the material or units used to form a cap or finish on top of a wall, pier, pilaster, or chimney.

corbel — a projection from the face of a beam, girder, column, or wall used as a beam seat or a decoration.

core (n.) — (1) the soil material enclosed within a tubular pile after driving (it may be replaced with concrete); (2) the mandrel used for driving casings for cast-in-place piles; (3) a structural shape used to internally reinforce a drilled-in-caisson; (4) a cylindrical sample of hardened concrete or rock obtained by means of a core drill; (5) the molded open space in a concrete masonry unit or precast concrete unit (see also **blockout**); (6) the area enclosed by ties or spiral reinforcement in a concrete column.

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core (v.) — the act of obtaining cores from concrete structures, rock foundations, or soils.

core test — compression test on a concrete specimen cut from hardened concrete by means of a core drill.

cored beam — a beam whose cross section is partially hollow or a beam from which cored samples of concrete have been taken.

coring — the act of obtaining cores from hardened concrete or masonry structures, rock, or soil.

corner reinforcement — (1) concrete reinforcement used at wall intersections or near corners of square or rectangular openings in walls, slabs, or beams; (2) metal reinforcement for plaster at reentrant corners to provide continuity between two intersecting planes.

corrosion — deterioration of a material, usually a metal, that results from a chemical reaction with its environment.

corrosion inhibitor — a chemical compound that effectively decreases corrosion rate of steel reinforcement without reducing the concentration of the corrosive agent at the bar level.

cotton mats — cotton-filled quilts fabricated for use as a water-retaining covering in curing concrete surfaces.

coupler — (1) a device for connecting reinforcing bars or prestressing tendons end to end; (2) a device for locking together the component parts of a tubular metal scaffold (also known as a clamp); (3) internal threaded device for joining reinforcing bars with matching threaded ends for the purpose of providing transfer of either axial compression, axial tension, or both from one bar to the other. (See also **coupling sleeve**, **end-bearing sleeve**, and **mechanical connection**.)

coupling agent — a substance used between the transducer and test surface to permit or improve transmission of ultrasonic energy.

coupling sleeve — device fitting over the ends of two reinforcing bars for the eventual purpose of providing transfer of either axial compression or axial tension or both from one bar to the other. (See also **coupler**, **end-bearing sleeve**, and **mechanical connection**.)

course — in concrete construction, a horizontal layer of concrete, usually one of several making up a lift; in masonry construction, a horizontal layer of block or brick. (See also **lift**.)

cover — the least distance between the surface of embedded reinforcement and the surface of the concrete.

crack — a complete or incomplete separation of either concrete or masonry into two or more parts produced by breaking or fracturing. (See also **fracture**.)

crack-control reinforcement — reinforcement in concrete construction designed to minimize opening of cracks, often effective in limiting them to uniformly distributed small cracks. (See also **shrinkage reinforcement** and **temperature reinforcement**.)

cracked section — a section designed or analyzed on the assumption that concrete has no resistance to tensile stress.

cracking load — the load that causes tensile stress in a member to exceed the tensile strength of the concrete.

craze cracks — fine random cracks or fissures in a surface of plaster, cement paste, mortar, or concrete.

crazing — the development of craze cracks; the pattern of craze cracks existing in a surface. (See also **checking** and **crack**.)

creep — time-dependent deformation due to sustained load.

critical saturation — a condition describing the degree of filling by freezable water of a pore space in cement paste or aggregate that affects the response of the material to freezing; usually taken to be 91.7 percent because of the 9 percent increase in volume of water undergoing the change of state to ice.

cross bracing — crossing members usually designed to act only in tension, often used in scaffolding systems. (See also **sway brace** and **X-brace**.)

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cross section — (1) a plane through a body perpendicular to a given axis of the body; (2) a drawing showing such a plane.

crush plate — an expendable strip of wood attached to the edge of a form or intersection of fitted forms to protect the form from damage during prying, pulling, or other stripping operations.

crushed gravel — the product resulting from the artificial crushing of gravel with a specified minimum percentage of fragments having one or more faces resulting from fracture. (See also **coarse aggregate**.)

crushed stone — the product resulting from the artificial crushing of rocks, boulders, or large cobblestones, substantially all faces of that possess well-defined edges resulting from the crushing operation. (See also **coarse aggregate**.)

crusher-run aggregate — aggregate that has been mechanically broken and has not been subjected to subsequent screening.

cube strength — concrete compressive strength determined using a standard cube test specimen. (See also **concrete compressive strength**.)

cumulative batching — measuring more than one ingredient of a batch in the same container by bringing the batcher scale into balance at successive total weights as each ingredient is accumulated in the container.

curing — action taken to maintain moisture and temperature conditions in a freshly placed cementitious mixture to allow hydraulic cement hydration and (if applicable) pozzolanic reactions to occur so that the potential properties of the mixture may develop.

curing agent — a catalytic or reactive agent that induces cross-linking in a thermosetting resin. (See also **hardener**.)

curing blanket — a covering of sacks, matting, burlap, straw, waterproof paper, or other suitable material placed over freshly finished concrete. (See also **burlap**.)

curing compound — a liquid applied to the surface of newly placed concrete that retards the loss of water and, if pigmented, reflects sunlight. (See also **curing** and **membrane curing**.)

curing cycle — see **autoclave**.

curing delay — see **presteaming period** (preferred term).

curing kiln — see **autoclave curing**.

curing membrane — see **membrane curing** and **curing compound**.

curling — out-of-plane deformation of the corners, edges, and surface of a pavement, slab, or wall panel from its original shape. (See also **warping**.)

curtain grouting — injection of grout into a subsurface formation in such a way as to create a zone of grouted material transverse to the direction of anticipated water flow.

curvature friction — friction resulting from bends or curves in the specified prestressing cable profile.

cutting screed — sharp-edged tool used to trim shotcrete to the finished outline. (See also **rod**.)

cuttings — shotcrete material that has been applied beyond the finish face and is cut off in the trimming or rodding process.

cylinder strength — see **concrete compressive strength** and **splitting tensile strength**.

dampproofing — treatment of concrete or mortar to retard the passage or absorption of water or water vapor either by application of a suitable coating to exposed surfaces, or by use of a suitable admixture or treated cement, or by use of a preformed film such as polyethylene sheets placed on ground before placing a slab. (See also **vapor retarder**.)

darby — a hand-manipulated straightedge, usually 3 to 8 ft (1 to 2.5 m) long, used in the early stage leveling operations of concrete or plaster, preceding supplemental floating and finishing.

dash-bond coat — a thick slurry of portland cement, sand, and water flicked on surfaces with a paddle or brush to provide a base for subsequent portland cement plaster coats, sometimes used as a final finish on plaster.

davit — a device used to support and swing the access covers away from openings of vessels and tanks.

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D-cracking — a series of cracks in concrete near and roughly parallel to joints and edges resulting from use of coarse aggregate that is susceptible to damage during cycles of freezing and thawing.

dead end — in the stressing of a tendon from one end only, the end opposite that to which the load is applied.

dead load — (1) the weights of the structural members, supported structure, and permanent attachments or accessories that are likely to be present on a structure in service; (2) loads meeting specific criteria found in the governing building code (without load factors).

dead-end anchorage — the anchorage at that end of a tendon that is opposite the jacking end.

deadman — an anchor for a guy line, usually a beam, block, or other heavy item buried in the ground, to which a line is attached.

debonding — (1) preventing bond of prestressing tendons to surrounding concrete; (2) bond failure at the interface between a substrate and a strengthening or repair system.

decentering — lowering or removing centering or shoring.

deck — the form on which concrete for a slab is placed, also the floor or roof slab itself. (See also **bridge deck**.)

decking — sheathing material for a deck or slab form.

decorative concrete — concrete exposed to view and used to create architectural or artistic enhancements to an area by use of natural or synthetic color, finishing texture, molds, stencils, embossing, acid or blast etching, grinding, polishing, permanent transfers, or embedment of concrete-compatible items or a combination of those techniques.

deflected tendons — see **draped tendons** (preferred term).

deflection — movement of a point on a structure or structural element, usually measured as a linear displacement or as succession displacements transverse to a reference line or axis.

deformation — a change in dimension or shape. (See also **expansion**, **creep**, **length change**, **volume change**, **shrinkage**, and **time-dependent deformation**.)

deformed bar — a reinforcing bar with a manufactured pattern of surface ridges intended to reduce slip and increase pullout resistance of bars embedded in concrete.

deformed reinforcement — metal bars, wire, or reinforcement with a manufactured pattern of surface ridges that provide a locking anchorage with surrounding concrete.

deformed tie bar — see **tie bar**.

dehydration — removal of chemically bound, adsorbed, or absorbed water from a material.

deicer — a chemical, such as sodium or calcium chloride, used to melt ice or snow on slabs and pavements; such melting being due to depression of the freezing point.

delamination — a planar separation in a material that is roughly parallel to the surface of the material.

delay — see **presteaming period**.

delayed ettringite formation — a form of sulfate attack by which mature hardened concrete is damaged by internal expansion during exposure to cyclic wetting and drying in service and caused by the late formation of ettringite, not because of excessive sulfate; not likely to occur unless the concrete has been exposed to temperatures during curing of 158ºF (70ºC) or greater and less likely to occur in concrete made with pozzolan or slag cement. (See also **ettringite**.)

delivery hose — hose through which shotcrete, grout, or pumped concrete or mortar passes (also called conveying hose or material hose).

demold — to remove molds from concrete test specimens or precast products. (See also **strip**.)

dense-graded aggregate — aggregates graded to produce low void content and maximum density when compacted. (See also **well-graded aggregate**.)

densifier — combination of silicate and water-based compounds that react on the surface of the concrete to produce additional calcium silicate hydrate.

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(C-S-H); silicates are combined with carrier compounds, most commonly sodium-, potassium-, or lithium-based to aid the process. Some products also contain siliconate.

density — mass per unit volume.

density (dry) — the mass per unit volume of a dry substance at a stated temperature.

density control — control of density of concrete in field construction to ensure that specified values as determined by standard tests are obtained.

design-bearing pressure — the vertical load per unit area that may be applied to the bearing stratum at the level of the pier bottom.

design load — applicable loads and forces or their related internal moments and forces used to proportion members.

design strength — nominal strength multiplied by a strength reduction factor ϕ. (See also **nominal strength** and **phi factor**).

deterioration — (1) physical manifestation of failure of a material (for example, cracking, delamination, flaking, pitting, scaling, spalling, and staining) caused by environmental or internal autogenous influences on rock and hardened concrete as well as other materials; (2) decomposition of material during either testing or exposure to service. (See also **disintegration** and **weathering**.)

development bond stress — see **anchorage bond stress** (preferred term).

development length — the bonded length required to achieve the design strength of a reinforcement at a critical section.

devils float — a wooden float with two nails protruding from the toe used to roughen the surface of a brown plaster coat. (See also **texturing**.)

diagonal crack — (1) in a flexural member, an inclined crack caused by shear stress, usually at approximately 45 degrees to the axis; (2) a crack in a slab, not parallel to either the lateral or longitudinal directions.

diagonal cracking — development of diagonal cracks. (See also **diagonal tension**.)

diagonal tension — the principal tensile stress resulting from the combination of normal and shear stresses acting upon a structural element.

diametral compression test — see **splitting tensile test**.

diamond mesh — a metallic fabric having rhomboidal openings in a geometric pattern. (See also **expanded-metal lath**.)

diatomaceous earth — a friable earthy material composed primarily of nearly pure hydrous amorphous silica (opal) in the form of frustules of the microscopic plants called diatoms.

dicalcium silicate — a compound having the composition $2CaO{\cdot}SiO_2$, abbreviated C_2S, an impure form of which occurs in portland-cement clinker (belite). (See also **belite**.)

differential thermal analysis (DTA) — indication of thermal reaction by differential thermocouple recording of temperature changes in a sample under investigation compared with those of a thermally passive control sample, both of which are subjected simultaneously to the same heating condition.

diffusion — movement of species (ions, gas, or vapor) from an area of higher concentration to an area of lower concentration independent of the bulk motion of a fluid.

dilation — an expansion of concrete during cooling or freezing generally calculated as the maximum deviation from the normal thermal contraction predicted from the length change/temperature curve or length change/time curve established at temperatures before initial freezing.

direct dumping — discharge of concrete directly into place from crane bucket or mixer.

discoloration — departure of color from that which is normal or desired.

disintegration — reduction into small fragments and subsequently into particles. (See also **deterioration** and **weathering**.)

dispersing agent — a material capable of increasing the fluidity of pastes, mortars, or concretes by reduction of inter-particle attraction.

distortion — see **deformation**

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