

# ACI Concrete Terminology (ACI CT-25)

## PREFACE

ACI 116, Cement and Concrete Terminology, was maintained by Committee 116 for many years. In 2007, ACI 116 was disbanded.

The ACI Technical Activities Committee decided to create a resource document rather than a committee document; therefore, the ACI Concrete Terminology (CT) was created. The CT was first published in 2013, and contained most of the terminology from ACI 116.

The CT is now maintained by staff and new definitions will originate from technical committees. Technical committees are considered the owners of definitions.

When ACI committee reports and guides are submitted for TAC review and approval, the definitions are automatically reviewed. The review of these terms includes a comparison with the Concrete Terminology (CT) definitions. The CT definitions can be revised based on revisions to committee-approved revisions.

- A/F ratio** — the molar or mass ratio of aluminum oxide ( $\text{Al}_2\text{O}_3$ ) to iron oxide ( $\text{Fe}_2\text{O}_3$ ), 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; the rate of change of velocity with respect to time of a vibrating structural member. (See also **accelerating admixture**.)
- accelerator** — see **accelerating admixture**.
- accelerometer** — sensor that may be mounted on a structure to measure acceleration at a point.
- 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 nor leaves a system.
- admixture** — see **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 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  $3\text{CaO} \cdot 2\text{SiO}_2 \cdot 3\text{H}_2\text{O}$  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 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 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.
- air separator** — an apparatus that separates various size fractions of ground materials pneumatically; fine particles are discharged as product, and 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<sub>2</sub>O and K<sub>2</sub>O. (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.

- alternative cement** — an inorganic cement that can be used as a complete replacement for portland or blended hydraulic cements, and that is not covered by applicable specifications for portland or blended hydraulic cements.
- alumina** — aluminum oxide ( $Al_2O_3$ ).
- aluminate cement** — see **calcium-aluminate cement**.
- aluminated 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** — 1) the maximum displacement from the mean position in connection with vibration; 2) measure of the change in stress during a load cycle, or the difference between the mean stress and the peak stress.
- 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.
- 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% calcium chloride, typically in pellet form.
- anti-washout admixture** — a chemical admixture that reduces the loss of fine materials from cement-based materials 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.
- 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**.
- autoclaved aerated concrete** — cementitious product based on calcium silicate hydrates in which low density is attained by the inclusion of an agent resulting in macroscopic voids and is subjected to high-pressure steam 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].)
- backflow** — a condition whereby the grout front reverses direction and flows back on top of the grout layer in the bottom of the duct.
- 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 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 tradesperson 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 ( $\text{BaSO}_4$ ), 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,  $2\text{CaSO}_4 \cdot \text{H}_2\text{O}$ . (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 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 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 free body 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**.)
- 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 and filtering action of strands and wires; pressure increases the propensity of a grout to bleed.
- 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.
- 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]**.)
- 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 ( $2\text{CaO}\cdot\text{SiO}_2$ ), 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  $4\text{CaO}\cdot\text{Al}_2\text{O}_3\cdot\text{Fe}_2\text{O}_3$  ( $\text{C}_4\text{AF}$ ) occurring in portland and calcium-aluminate cement, now used to refer to a series of solid solutions between  $2\text{CaO}\cdot\text{Fe}_2\text{O}_3$  ( $\text{C}_2\text{F}$ ) and  $2\text{CaO}\cdot\text{Al}_2\text{O}_3$  ( $\text{C}_2\text{A}$ ).
- brucite** — a mineral having the composition magnesium hydroxide,  $\text{Mg}(\text{OH})_2$ , and a specific crystal structure.
- bruised surface** — a surface layer weakened by interconnected microcracks in the concrete substrate caused by use of high-impact, mechanical methods for concrete removal or surface preparation or both.
- 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).
- 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).
- burnish** — to create a shiny surface on hardened concrete by friction rubbing.
- burnishing** — enhancing the surface sheen of existing concrete by friction rubbing, utilizing high-speed rotational equipment with a minimum of 1500 RPM.
- 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 ( $\text{C}_{17}\text{H}_{35}\text{COOC}_4\text{H}_9$ ) 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 ( $\text{CaCO}_3$ ) 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 [ $\text{Ca}_4(\text{AlO}_2)_6\text{SO}_4$ ] 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** —  $\text{CaCl}_2$ , a crystalline solid, 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** —  $\text{Ca}(\text{C}_{18}\text{H}_{35}\text{O}_2)_2$ , 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.
- 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 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**.)
- 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 thermochemical 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.
- 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)** — 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  $\mu\text{m}$ ; 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 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.
- 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, and troweling, 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**.)
  - (4) an organic compound applied to fabric before and after weaving to increase durability and stability of the fabric, and allowing for ease of handling and installation.
- 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/D1196M](#) (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** — when air temperature has fallen to, or is expected to fall below, 40°F (4°C) during the protection period; protection period is defined as the time recommended to prevent concrete from being adversely affected by exposure to cold weather during construction.
- 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 ( $\text{Ca}_2\text{B}_6\text{O}_{11}\cdot 5\text{H}_2\text{O}$ ). (See also **boron-loaded concrete**.)
- collated fiber** — fibers bundled together either by crosslinking 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.
- 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 cover** — distance between the outermost surface of embedded reinforcement and the closest outer surface of the concrete.
- concrete dye** — colorant for concrete that is applied to the concrete while it is in solution and results in a stained appearance; concrete dyes do not produce color via chemical reaction.
- 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 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.
- 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**.)

- 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 chaser** — rotary tool using a v-shaped diamond blade to enlarge cracks in concrete to facilitate repair.
- 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% because of the 9% 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**.)
- 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 crosslinking 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 caused by a normally-occurring combination of differences in moisture content and temperature between the two surfaces of the panel; taken independently, temperature differentials result in curling and moisture differentials result in warping. (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.
- cycle** — process of loading and unloading a material sample or structural element once.
- cylinder strength** — see **concrete compressive strength** and **splitting tensile strength**.
- damage** — (1) changes in capacity of an existing structure resulting from events, such as loading and displacements; (2) irreversible physical change of a material or structural element resulting in a loss in performance.
- 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.
- data acquisition system** — electronic system used to sample (or digitize), and store data gathered from a sensor.
- davit** — a device used to support and swing the access covers away from openings of vessels and tanks.
- 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.
- defect** — material imperfection likely to develop as a fatigue crack. Defects occur at a variety of scales, such as slip discontinuities, cracks, inclusions, debond interfaces or delaminations, voids, dry or misaligned fibers in FRP materials, and nicks and scrapes resulting from handling damage.
- 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 158°F (70°C) 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**.)
- denier** — measure of fiber linear mass density, taken as the mass in grams of 29,528 ft (9000 m) of the fiber.
- 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 in the surface of the concrete to produce additional calcium silicate hydrate (C-S-H); silicates are combined with carrier compounds, most commonly sodium-, potassium-, or lithium-based to aid the process. Some products also contain silicate.
- 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  $\phi$ . (See also **nominal strength** and **phi [ $\phi$ ] factor**.)

- detailer** — person, firm, or corporation producing the reinforcing steel fabrication details and placing drawings based on the design drawings and design details for the structure.
- detailing** — the process of determining fabrication details based on design details.
- 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  $2\text{CaO}\cdot\text{SiO}_2$  (abbreviated  $\text{C}_2\text{S}$ ), 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 interparticle attraction.
- distortion** — see **deformation**.
- distress** — physical manifestation of cracking and distortion in a concrete structure as the result of stress, chemical action, or both.
- distribution-bar reinforcement** — small-diameter bars, usually at right angles to the main reinforcement, intended to spread a concentrated load on a slab and to prevent cracking.
- D-line cracks** — see **D-cracking** (preferred term).
- dome** — square prefabricated pan form used in two-way (waffle) concrete joist floor construction.
- dormant crack** — a crack whose width does not change with time.
- double-tee beam** — a precast-concrete member composed of two stems and a combined top flange, commonly used as a beam but also used vertically in exterior walls.

- double-up** — a method of plastering characterized by application in successive operations with no setting or drying time between coats.
- dowel** — (1) a steel pin, commonly a plain or coated round steel bar that extends into adjoining portions of a concrete construction, as at an expansion or contraction joint in a pavement slab, to transfer shear loads; (2) a deformed reinforcing bar intended to transmit tension, compression, or shear through a construction joint.
- dowel rod** — see **dowel** (preferred term).
- dowel-bar reinforcement** — see **dowel**.
- drainage fill** — (1) base course of granular material placed between floor slab and subgrade to impede capillary rise of moisture; (2) lightweight concrete placed on floors or roofs to promote drainage.
- draped tendons** — tendons that have a trajectory that is curved or bent with respect to the gravity axis of the concrete member.
- drier** — chemical that promotes oxidation or drying of a paint or adhesive.
- drilled pier** — a concrete pier, with or without a casing, cast in place in a hole bored in soil or rock. (See also **cast-in-place pile**.)
- drilled pile** — see **drilled pier**.
- drilled-in caisson** — cast-in-place pile formed by driving an open-ended steel pipe into bedrock or other bearing layer, cleaning out the pipe, drilling a socket into the bedrock or other bearing layer, and placing the steel reinforcement and concrete (also called caisson foundation or caisson).
- drip** — a transverse groove in the underside of a projecting piece of wood, stone, or concrete to prevent water from flowing back to a wall.
- drop panel** — the thickened structural portion of a flat slab in the area surrounding column, column capital, or bracket to reduce the intensity of stresses.
- dropchute** — a device used to confine or to direct the flow of a falling stream of fresh concrete.
- (1) *articulated dropchute* — a device consisting of a succession of tapered metal cylinders so designed that the lower end of each cylinder fits into the upper end of the one below.
- (2) *flexible dropchute* — a device consisting of a heavy rubberized canvas or plastic collapsible tube.
- dry mix** — (1) a concrete, mortar, or plaster mixture, commonly sold in bags, containing all components except water; (2) a concrete of near-zero slump.
- dry mixing** — blending of the solid materials for mortar or concrete before adding the mixing water.
- dry pack** — concrete or mortar mixtures deposited and consolidated by dry packing.
- dry packing** — placing of zero-slump, or near-zero-slump, concrete, mortar, or grout by ramming into a confined space.
- dry process** — in the manufacture of cement, the process in which the raw materials are ground, conveyed, blended, and stored in a dry condition. (See also **wet process**.)
- dry rodding** — in measurement of the mass per unit volume of coarse aggregates, the process of consolidating dry material in a calibrated container by rodding under standardized conditions.
- dry topping** — see **dry-shake** (preferred term)
- dry-batch weight** — the mass of the materials, excluding water, used to make a batch of concrete.
- dry-cast process** — a process for producing concrete products, such as pipe, using low-frequency high-amplitude vibration to consolidate dry-mix concrete in the form. (See also **centrifugal process**, **packerhead process**, **tamp process**, and **wet-cast process**.)
- dry-mix shotcrete** — shotcrete in which most of the mixing water is added at the nozzle (also called dry-process shotcrete).
- dry-packed concrete** — concrete placed by dry packing.
- dry-rodded density** — mass per unit volume of dry aggregate, which includes the volume of the particles and the voids between particles, compacted by rodding under standardized conditions.

- dry-rodded volume** — the bulk volume occupied by a dry aggregate compacted by rodding under standardized conditions; used in measuring density of aggregate.
- dry-rodded weight** — (deprecated term) see **dry-rodded density**.
- dry-shake** — a dry mixture of hydraulic cement and fine aggregate (either mineral or metallic) that is distributed evenly over the surface of concrete flatwork and worked into the surface before time of final setting and then floated and troweled to desired finish.
- dry-tamp process** — see **dry packing** (preferred term).
- drying creep** — creep caused by drying. (See also **creep** and **basic creep**.)
- drying shrinkage** — shrinkage resulting from loss of moisture.
- duct** — the material creating a conduit in a concrete member to accommodate the prestressing steel of a post-tensioning tendon.
- ductility** — ratio of displacement at ultimate strength to the displacement at which yield of the flexural reinforcement occurs.
- Dunagan analysis** — (obsolete) a method of separating the ingredients of freshly mixed concrete or mortar to determine the proportions of the mixture.
- durability** — the ability of a material to resist weathering action, chemical attack, abrasion, and other conditions of service.
- durability factor** — (1) a measure of the change in a material property over a period of time as a response to exposure to a treatment that can cause deterioration, usually expressed as percentage of the value of the property before exposure; (2) in [ASTM C666/C666M](#), a measure of the effects of freezing-and-thawing action on concrete specimens.
- dust of fracture (in aggregate)** — rock dust created during production, processing, or handling.
- dusting** — the development of a powdered material at the surface of hardened concrete.
- dynamic analysis** — analysis of stresses in framing as functions of displacement under transient loading.
- dynamic load** — an imposed load that is in motion and may vary with time in magnitude or direction.
- dynamic loading** — loading from units (particularly machinery) that, by virtue of their movement or vibration, impose stresses in excess of those imposed by their dead load.
- dynamic modulus of elasticity** — the modulus of elasticity computed from the size, mass, shape, and fundamental frequency of vibration of a concrete test specimen, or from pulse velocity. (See also **pulse velocity**.)
- early age (of concrete)** — the period after final setting during which properties are changing rapidly.
- early stiffening** — the early development of an abnormal reduction in the working characteristics of a hydraulic-cement paste, mortar, or concrete, which may be further described as false setting, quick setting, or flash setting.
- early strength** — strength of concrete or mortar usually as developed at various times during the first 72 hours after placement.
- early-entry dry cut saw** — a tool designed to cut joints in concrete commencing 1 to 4 hours after finishing and without raveling the cut edges.
- eccentric tendon** — a prestressing tendon that follows a trajectory not coincident with the gravity axis of the concrete member.
- edge beam** — a stiffening beam at the edge of a slab.
- edge form** — formwork used to limit the horizontal spread of fresh concrete on flat surfaces such as pavements or floors.
- edge reinforcement** — tensile reinforcement sometimes used to strengthen otherwise inadequate edges in a slab without resorting to edge thickening.
- edger** — a finishing tool used on the edges of fresh concrete to provide a rounded edge.
- edging** — the operation of tooling the edges of a fresh concrete slab to provide a rounded corner.
- effective area of concrete** — area of a concrete section assumed to resist shear or flexural stresses.
- effective depth of section** — distance measured from extreme compression fiber to centroid of longitudinal tension reinforcement.
- effective flange width** — width of slab adjoining a beam stem where the slab is assumed to function as the flange element of a T-beam section.

- effective prestress** — stress remaining in prestressing steel after all losses have occurred (also called final prestress or final stress).
- effective span** — the lesser of the two following distances: (a) the distance between supports; (b) the clear distance between supports plus the effective depth of the beam or slab.
- effective stress** — see **effective prestress**.
- effective width of slab** — that part of the width of a slab taken into account when designing T- or L-beams.
- efflorescence** — a generally white deposit formed when water-soluble compounds emerge in solution from concrete, masonry, or plaster substrates and precipitate by reaction such as carbonation or crystallize by evaporation.
- elastic design** — design based on a linear distribution of flexural stresses and strains and corresponding limiting elastic properties of the material.
- elastic limit** — the limit of stress beyond which the strain is not wholly recoverable.
- elastic loss** — in prestressed concrete, the reduction in prestressing load resulting from the elastic shortening of the member.
- elastic shortening** — in prestressed concrete, the shortening of a member that occurs immediately on the application of forces induced by prestressing.
- elasticity** — that property of a material by virtue of which it tends to recover its original size and shape after deformation.
- electrical curing** — a system in which a favorable temperature is maintained in freshly placed concrete by supplying heat generated by electrical resistance.
- electrolysis** — production of chemical changes by the passage of current through an electrolyte.
- electrolyte** — a conducting medium in which the flow of current is accompanied by movement of matter; usually an aqueous solution.
- elephant trunk** — an articulated tube or chute used in concrete placement. (See also **dropchute** and **tremie**.)
- elongated piece (of aggregate)** — particle of aggregate for which the ratio of the length to the width of its circumscribing rectangular prism is greater than a specified value. (See also **flat piece [of aggregate]**.)
- elongation** — increase in length. (See also **expansion**, **elastic shortening**, and **swelling**.)
- embedment length** — the length of embedded reinforcement provided beyond a critical section.
- emery** — a rock consisting essentially of an intercrystalline mixture of corundum and either magnetite or hematite. (See also **dry-shake**.)
- emulation** — designing precast elements and their structural connections to perform as if the structure was a conventional cast-in-place concrete structure.
- emulative detail** — a connection in which the structural performance is equivalent to that of a continuous member or a monolithic connection.
- emulsion** — a two-phase liquid system in which small droplets of one liquid (the internal phase) are immiscible in, and dispersed uniformly throughout, a second continuous liquid phase (the external phase).
- enclosure wall** — a non-load-bearing wall intended only to enclose space.
- encrustation** — see **incrustation** (preferred term).
- end anchorage** — (1) length of reinforcement, mechanical anchor, hook, or combination thereof, beyond the point of nominal zero stress in the reinforcement of cast-in-place concrete; (2) mechanical device to transmit prestressing force to the concrete in a post-tensioned member. (See also **anchorage**.)
- end block** — an enlarged end section of a member intended to reduce anchorage stresses to allowable values and provide space needed for post-tensioning anchorages.
- end-bearing sleeve** — device fitting over the abutting ends of two reinforcing bars for the purpose of assuring transfer of only axial compression from one bar to the other. (See also **coupler**, **coupling sleeve**, and **mechanical connection**.)
- endothermic reaction** — a chemical reaction that occurs with the absorption of heat.
- engineer-architect** — see **architect-engineer**.
- engineered cementitious composite** — easily molded mortar-based composite reinforced with specially selected short random fibers, usually polymer fibers.

- entrained air** — microscopic air bubbles intentionally incorporated in mortar or concrete during mixing, usually by use of a surface-active agent; typically between 10  $\mu\text{m}$  (0.004 in.) and 1 mm (0.04 in.) in diameter and spherical or nearly so. (See also **air entrainment**.)
- entrapped air** — air voids incorporated into concrete during mixing that are mainly irregular in shape and usually 1 mm (0.04 in.) or larger in size.
- environmental engineering concrete structures** — structures designed for the transmission, containment, or treatment of liquids or other materials such as solid waste.
- epoxy** — a thermosetting polymer that is the reaction product of epoxy resin and compatible hardener. (See also **epoxy resin**.)
- epoxy concrete** — a mixture of epoxy resin and hardener, fine aggregate, and coarse aggregate. (See also **polymer concrete**, **mortar**, **epoxy**, and **epoxy resin**.)
- epoxy grout** — a grout consisting of an epoxy bonding system, aggregate or fillers, and possibly other materials.
- epoxy mortar** — a mixture of epoxy resin, hardener, and fine aggregate. (See also **epoxy resin**.)
- epoxy resin** — a class of organic resin that, when combined with compatible hardener, is used in the preparation of special coatings or adhesives or as binders in epoxy mortars, epoxy grouts, epoxy concretes, and fiber-reinforced polymer composites. (See also **epoxy**.)
- epoxy-coated bar** — a reinforcing bar coated with epoxy. (See also **epoxy**.)
- equilibrium density** — the density reached by structural lightweight concrete after exposure to relative humidity of  $50 \pm 5\%$  and a temperature of  $73.5 \pm 3.5^\circ\text{F}$  ( $23 \pm 2^\circ\text{C}$ ) for a period of time sufficient to reach a density that changes less than 0.5% in a period of 28 days.
- equivalent embedment length** — the length of embedded reinforcement that can develop the same stress as that which can be developed by a hook or mechanical anchorage.
- equivalent fiber diameter** — diameter of a circle having an area equal to the average cross-sectional area of a fiber.
- equivalent rectangular stress distribution** — an assumption of uniform stress on the compression side of the neutral axis in the strength design method to determine flexural capacity.
- erosion** — progressive loss of material from a solid surface due to a mechanical interaction between that surface and a fluid, a multi-component fluid, or solid particles carried with the fluid. (See also **abrasion damage** and **cavitation damage**.)
- ettringite** — (1) a mineral, high-sulfate calcium sulfoaluminate ( $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 3\text{CaSO}_4 \cdot 30\text{--}32\text{H}_2\text{O}$ ), occurring in nature or formed by sulfate attack on mortar and concrete; (2) the product of the principal expansion-producing reaction in expansive cements.
- evaporable water** — water in set cement paste present in capillaries or held by surface forces; measured as that removable by drying under specified conditions. (See also **nonevaporable water**.)
- evaporation reducer** — see **evaporation retardant**.
- evaporation retardant** — a material applied to the surface of concrete before initial setting to reduce the evaporation rate of water without interfering with finishing operations (also called evaporation reducer). (See also **monomolecular**.)
- exfoliation** — disintegration occurring by peeling off in successive layers, swelling up and opening into leaves or plates like a partly opened book.
- exothermic reaction** — a chemical reaction that occurs with the evolution of heat.
- expanded blast-furnace slag** — see **blast-furnace slag**.
- expanded shale (clay or slate)** — lightweight vesicular aggregate obtained by firing suitable raw materials in a rotary kiln or on a sintering grate under controlled conditions.
- expanded-metal fabric reinforcement** — see **expanded-metal lath**.
- expanded-metal lath** — a metal network, often used as reinforcement in construction, formed by suitably stamping or cutting sheet metal and stretching it to form open meshes, either of diamond-shaped or rhomboidal-shaped openings. (See also **diamond mesh**.)

- expansion** — increase in either length or volume. (See also **shrinkage**, **volume change**, and **autogenous volume change**.)
- expansion joint** — (1) a separation provided between adjacent sections of a concrete structure to allow movement due to dimensional increases and reductions of the adjacent sections and through which some or all the bonded reinforcement is interrupted; (2) a separation between pavement slabs-on-ground, filled with a compressible filler material.
- expansion sleeve** — a tubular metal covering for a dowel bar to allow its free longitudinal movement at a joint.
- expansive cement** — a cement that when mixed with water produces a paste that after setting increases in volume to a greater degree than does portland-cement paste.
- (1) *Type K expansive cement* — a mixture of portland cement, anhydrous tetracalcium trialuminate sulfate ( $C_4A_3S$ ), calcium sulfate ( $CaSO_4$ ), and lime ( $CaO$ ).
  - (2) *Type M expansive cement* — interground or blended mixtures of portland cement and calcium sulfate suitably proportioned.
  - (3) *Type S expansive cement* — a portland cement containing a high computed tricalcium aluminate ( $C_3A$ ) content and an amount of calcium sulfate above the usual amount found in portland cement.
- expansive component** — the portion of an expansive cement that is responsible for the expansion, generally one of several anhydrous calcium aluminate or sulfoaluminate compounds and a source of sulfate, with or without free lime ( $CaO$ ).
- exposed-aggregate finish** — a decorative finish for concrete work achieved by removing, generally before the concrete has hardened, the outer skin of mortar and exposing the coarse aggregate.
- exposure class** — designation used to describe environmental conditions to which concrete will be exposed.
- extender** — a finely divided inert mineral added to provide economical bulk in paints, synthetic resins and adhesives, or other products.
- extensibility** — that property by virtue of which a material can undergo extension or elongation following the application of force.
- exterior panel** — in a flat slab, a panel having at least one edge that is not in common with another panel.
- external vibrator** — see **vibrator**.
- extreme compression fiber** — farthest fiber from the neutral axis on the compression side of a member subjected to bending.
- extreme tension fiber** — farthest fiber from the neutral axis on the tension side of a member subjected to bending.
- exudation** — a liquid or viscous gel-like material discharged through a pore, crack, or opening in the surface of concrete.
- fabric** — manufactured planar textile structure made of fibers, yarns, or both, that is assembled by various means such as weaving, knitting, tufting, felting, braiding, or bonding of webs.
- fabric-reinforced cementitious matrix composite** — composite material consisting of inorganic matrix reinforced with dry fibers and externally bonded to concrete structural members.
- fabricator** — person, firm, or corporation producing the reinforcing steel cut and bent to needed dimensions and geometry.
- factor of safety** — the ratio of the ultimate capacity to the magnitude of the demand at the service level.
- factored load** — load, multiplied by appropriate load factors, used to proportion members by the strength-design method.
- failure** — partial or complete loss of load-carrying capacity of an individual element or component.
- false header** — see **header**.
- false setting** — the rapid development of rigidity in a freshly mixed portland-cement paste, mortar, or concrete without the evolution of much heat, which rigidity can be dispelled and plasticity regained by further mixing without addition of water. (See also **flash setting**.)

- falsework** — the temporary structure erected to support work in the process of construction. (See also **formwork**.)
- fascia** — a flat member or band at the surface of a building or the edge beam of a bridge; also exposed eave of a building.
- fastener** — a device designed to attach, join, or hold two or more objects one to another.
- fatigue** — process of mechanical degradation resulting from the application of repeated loads, such as traffic loading or wind loads on a bridge, that causes damage in a material or structural element.
- fatigue failure** — rupture of a material, when subjected to repeated loadings, at a stress substantially less than the static strength.
- fatigue life** — number of applied load cycles resulting in failure of a material or structural element.
- fatigue strength** — the greatest stress that can be sustained for a given number of stress cycles without failure.
- faulting** — differential displacement of a slab or wall along a joint or crack.
- feather edge** — the edge of a concrete or mortar patch or topping that is beveled at an acute angle.
- feed wheel** — material distributor or regulator in certain types of shotcrete equipment.
- ferrocement** — a composite structural material comprising thin sections consisting of cement mortar reinforced by a numerous closely spaced layers of steel wire mesh.
- fiber** — a slender and elongated solid material, generally with a length at least 100 times its diameter.
- fiber aspect ratio** — the ratio of length to diameter of a fiber in which the diameter may be an equivalent diameter. (See also **equivalent fiber diameter**.)
- fiber count** — the number of fibers in a unit volume of fiber-reinforced concrete.
- fabric-reinforced cementitious matrix composite** — composite material consisting of inorganic matrix reinforced with dry fibers and externally bonded to concrete structural members
- fiber-reinforced concrete** — concrete containing dispersed, randomly oriented fibers.
- fiber-reinforced polymer (FRP)** — a general term for a composite material comprising a polymer matrix reinforced with fibers in the form of fabric, mat, strands, or any other fiber form. (See **composite**.)
- field bending** — bending of reinforcing bars at the job site rather than in a fabricating shop.
- field concrete** — concrete delivered to or mixed, placed, and cured on the job site.
- field-cured cylinders** — test cylinders that are left at the job site for curing as nearly as practicable in the same manner as the concrete in the structure to indicate when supporting forms may be removed, additional construction loads may be imposed, or the structure may be placed in service.
- field-proportioned grout** — a hydraulic-cement grout batched at the job site using water and predetermined portions of hydraulic cement, aggregate, and other ingredients.
- filler** — (1) a finely divided, relatively inert material (such as pulverized limestone, silica, or colloidal substances) added to portland cement, paint, resin, or other materials to reduce shrinkage, improve workability, reduce cost, or reduce density; (2) material used to fill an opening in a form.
- fillet** — see **chamfer strip**.
- fin** — (1) a narrow linear projection on a formed concrete surface, resulting from mortar flowing into spaces in the formwork; (2) a type of blade in a concrete mixer drum.
- final curing** — deliberate action taken between the final finishing and termination of curing to reduce the loss of water from the surface of the concrete and control the temperature of the concrete.
- final prestress** — see **effective prestress**.
- final setting** — a degree of stiffening of a cementitious mixture greater than initial setting, generally stated as an empirical value indicating the time required for the cementitious mixture to stiffen sufficiently to resist, to an established degree, the penetration of a weighted test device. (See also **initial setting**.)

- final setting time** — the time required for a freshly mixed cement paste, mortar, or concrete to achieve final set. (See also **initial setting time**.)
- final stress** — see **effective prestress** (preferred term).
- fine aggregate** — (1) aggregate passing the 9.5 mm (3/8 in.) sieve, almost entirely passing the 4.75 mm (No. 4) sieve, and predominantly retained on the 75  $\mu$ m (No. 200) sieve; (2) that portion of aggregate passing the 4.75 mm (No. 4) sieve and predominantly retained on the 75  $\mu$ m (No. 200) sieve. (See also **aggregate** and **sand**.)
- fine-grained soil** — soil in which the smaller grain sizes predominate, such as fine sand, silt, and clay.
- fineness** — a measure of particle size.
- fineness modulus** — a factor obtained by adding the total percentages of material in the sample that are coarser than each of the following sieves (cumulative percentages retained), and dividing the sum by 100: 150  $\mu$ m (No. 100), 300  $\mu$ m (No. 50), 600  $\mu$ m (No. 30), 1.18 mm (No. 16), 2.36 mm (No. 8), 4.75 mm (No. 4), 9.5 mm (3/8 in.), 19.0 mm (3/4 in.), 37.5 mm (1-1/2 in.), 75 mm (3 in.), and 150 mm (6 in.).
- finish** — the texture of a concrete surface after consolidating and finishing operations have been performed.
- finish coat** — (1) final thin coat of shotcrete in preparation for hand finishing; (2) final exposed coat of plaster or stucco.
- finish grinding** — (1) the final grinding of clinker into cement, with calcium sulfate in the form of gypsum or anhydrite generally being added; (2) the final grinding operation required for a finished concrete surface—for example, bump cutting of pavement, fin removal from structural concrete, and terrazzo floor grinding.
- finish screens** — vibrating horizontal screens operated at a batching plant so that an excessive amount of significant undersize material is removed.
- finishing** — leveling, smoothing, consolidating, and otherwise treating surfaces of fresh or recently placed concrete or mortar to produce desired appearance and service. (See also **float** and **trowel**.)
- finishing machine** — a power-operated machine used to produce the desired surface texture on a concrete slab.
- fire clay** — an earthy or stony mineral aggregate that has as the essential constituent hydrous silicates of aluminum with or without free silica and that is plastic when sufficiently pulverized and wetted, rigid when subsequently dried, and of suitable refractoriness for use in commercial refractory products.
- fire resistance** — (1) the property of a material or assembly to withstand fire or give protection from it; (2) the ability of building elements to confine a fire or, when exposed to fire, to continue to perform a given structural function, or both.
- fired strength** — the compressive or flexural strength of refractory concrete determined upon cooling after first firing to a specified temperature for a specified time.
- flash coat** — a thin coat of shotcrete used to cover minor blemishes on a concrete surface.
- flash setting** — the rapid development of rigidity in a freshly mixed portland-cement paste, mortar, or concrete, characteristically with the evolution of considerable heat, which rigidity cannot be dispelled nor can the plasticity be regained by further mixing without addition of water (also called quick setting). (See also **false setting**.)
- flashing** — a thin impermeable sheet (narrow in comparison with its length) installed as a cover to exclude water from exposed joints and at roof valleys, hips, parapets, or intersections of roof and chimney.
- flat jack** — a hydraulic jack consisting of light gauge metal that is folded and welded to a flat shape that expands under internal pressure.
- flat piece (of aggregate)** — one in which the ratio of the width to thickness of its circumscribing rectangular prism is greater than a specified value. (See also **elongated piece [of aggregate]**.)
- flat plate** — a flat slab without column capitals or drop panels. (See also **flat slab**.)

- flat slab** — a concrete slab reinforced in two or more directions and having drop panels, column capitals, or both. (See also **flat plate**.)
- flexible pavement** — a pavement structure that maintains intimate contact with and distributes loads to the subgrade and depends on aggregate interlock, particle friction, and cohesion for stability.
- flexural bond stress** — in structural-concrete members, the stress between the concrete and the reinforcing element that results from the application of external load.
- flexural rigidity** — a measure of stiffness of a member, indicated by the product of modulus of elasticity and moment of inertia divided by the length of the member.
- flexural strength** — the measured maximum resistance of a concrete specimen to flexural loading and reported as modulus of rupture. (See also **modulus of rupture**.)
- flint** — a variety of chert. (See also **chert**.)
- float** — a tool (not a darby), usually of wood, aluminum, or magnesium used in finishing operations to impart a relatively even but still open texture to an unformed fresh concrete surface. (See also **darby**.)
- float finish** — a rough, granular concrete surface texture obtained by finishing with a float.
- floating** — smoothing and subsequent compaction and consolidation of the unformed concrete surface.
- flocculation** — clustering of binder particles in cement paste at rest caused by interparticle forces, in part responsible for thixotropy, which results in an increase in yield stress.
- flow** — (1) time-dependent irrecoverable deformation (see also **creep**); (2) a measure of the consistency of freshly mixed concrete, mortar, or cement paste expressed in terms of the increase in diameter of a molded truncated cone specimen after jiggling a specified number of times; (3) movement of uncured resin under gravity loads or differential pressure.
- flow cone** — (1) a device for measurement of grout consistency in which a predetermined volume of grout is permitted to escape through a precisely sized orifice, the time of efflux being used as the indication of consistency; (2) the mold used to prepare a specimen for the flow test.
- flow line** — detectable line on a concrete wall or column usually departing somewhat from horizontal, that shows where the concrete in one placement has flowed horizontally before succeeding placement has been made.
- flow table** — a flat, circular jiggling device used in making flow tests for consistency of cement paste, mortar, or concrete. (See also **flow** (2).)
- flow trough** — a sloping trough used to convey concrete by gravity flow from either a truck mixer or a receiving hopper to the point of placement. (See also **chute**.)
- flowable consistency** — the consistency at which a grout will form a nearly level surface when lightly rodded; the consistency of a grout with at least 125% at five drops on the [ASTM C230/C230M](#) flow table and an efflux time through the [ASTM C939/C939M](#) flow cone of more than 30 seconds.
- flowing concrete** — a cohesive concrete mixture with a slump greater than 7-1/2 in. (190 mm).
- fluid consistency** — (1) the consistency at which a grout will form a nearly level surface without vibration or rodding; (2) the consistency of a grout that has an efflux time of less than 30 seconds through an [ASTM C939/C939M](#) flow cone.
- fluidifier** — an admixture employed in grout to increase fluidity without changing water content. (See also **water-reducing admixture**.)
- fluidity** — a measure of time, expressed in seconds, necessary for a stated quantity of grout to pass through the orifice of the flow cone.
- fly ash** — the finely divided residue that results from the combustion of ground or powdered coal and that is transported by flue gases from the combustion zone to the particle removal system.
- flying forms** — large, prefabricated units of formwork incorporating support and designed to be moved from place to place.
- foamed concrete** — low-density concrete made by the addition of a prepared foam or by generation of gas within the fresh mixture.

- fog curing** — (1) storage of concrete in a moist room in which the desired high humidity is achieved by the atomization of water (see also **moist room**); (2) application of atomized water to concrete, stucco, mortar, or plaster.
- fog room** — see **moist room** (preferred term).
- folded plate** — (1) a framing assembly composed of sloping slabs in a hipped or gabled arrangement; (2) prismatic shell with open polygonal section.
- footing** — a structural element of a foundation that transmits loads directly to the soil.
- form** — a temporary structure or mold for the support of concrete while it is setting and gaining sufficient strength to be self-supporting. (See also **formwork**.)
- form anchor** — device used to secure formwork to previously placed concrete of adequate strength, normally embedded in the concrete during placement.
- form coating** — a liquid applied to formwork surfaces to promote easy release from the concrete, preserve the form material, or retard setting of the near-surface matrix for preparation of exposed-aggregate finishes.
- form hanger** — device used to support formwork from a structural framework (the dead load of forms, mass of concrete, and construction and impact loads must be supported).
- form insulation** — insulating material applied to the outside of forms between studs and over the top in sufficient thickness and air tightness to conserve heat of hydration to maintain concrete at required temperatures in cold weather.
- form lining** — materials used to line the concreting face of formwork either to impart a smooth or patterned finish to the concrete surface, to absorb moisture from the concrete, or to apply a set-retarding chemical to the formed surface. (See also **sheathing**.)
- form oil** — oil applied to the interior surfaces of forms to promote easy release from the concrete when the forms are removed. (See also **release agent** and **bond breaker**.)
- form pressure** — lateral pressure acting on vertical or inclined formed surfaces, resulting from the fluid-like behavior of the fresh concrete confined by the forms.
- form release agent** — see **release agent**.
- form spacer** — see **spacer** and **spreader**.
- form spreader** — see **spreader**.
- form tie** — a mechanical connection in tension used to prevent concrete forms from spreading due to the fluid pressure of fresh concrete.
- formwork** — total system of support for freshly placed concrete including the mold or sheathing that contacts the concrete as well as supporting members, hardware, and necessary bracing (also called shuttering in the United Kingdom). (See also **falsework** and **centering**.)
- formwork engineer/contractor** — engineer of the formwork system or contractor in charge of designated aspects of formwork design and formwork operations.
- formwork tiers** — the number of frames of scaffolding erected one above the other.
- foundation** — a system of structural elements that transmits loads from the structure above to the earth.
- foundation bolt** — see **anchor bolt** (preferred term).
- fracture** — (1) a crack or break in concrete or masonry; (2) the configuration of a broken surface; (3) the action of cracking or breaking. (See also **crack**.)
- free fall** — (1) descent of freshly mixed concrete into forms without dropchutes or other means of confinement; (2) the distance through which such descent occurs; (3) uncontrolled fall of aggregate.
- free lime** — calcium oxide (CaO) (as in clinker and cement) that has not combined with SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, or Fe<sub>2</sub>O<sub>3</sub> during the burning process, usually because of underburning, insufficient grinding of the raw mixture, or the presence of traces of inhibitors.
- free moisture** — (1) moisture having essentially the properties of pure water in bulk; (2) moisture not absorbed by aggregate. (See also **surface moisture**.)
- free water** — see **free moisture** and **surface moisture**.
- frequency** — number of load cycles applied per unit of time.

- fresh concrete** — concrete that possesses enough of its original workability that it can be placed and consolidated by the intended methods.
- fresno trowel** — a thin steel trowel that is rectangular (with or without rounded corners), usually 4 to 10 in. (100 to 250 mm) wide and 20 to 36 in. (420 to 900 mm) long, with a 4 to 16 ft (1 to 5 m) long handle and used to smooth surfaces of nonbleeding concrete and shotcrete.
- friction loss** — the stress loss in a prestressing tendon resulting from friction between the tendon and duct or other device during stressing.
- friction pile** — a load-bearing pile that receives its principal vertical support from skin friction between the surface of the buried pile and the surrounding soil.
- frog** — a depression in the bed surface of a masonry unit (also called a panel).
- Fuller's curve** — an empirical curve for gradation of aggregates. (See also **grading curve**.)
- Fuller-Thompson ideal grading curve** — see **Fuller's curve** (preferred term).
- furring** — strips of wood or metal fastened to a wall or other surface to even it, to form an air space, to give appearance of greater thickness, or for the application of an interior finish such as plaster.
- ganged forms** — prefabricated panels joined to make a much larger unit (up to 30 by 50 ft) (9 by 15 m) for convenience in erecting, stripping, and reusing; usually braced with wales, strongbacks, or special lifting hardware.
- gap-graded aggregate** — aggregate graded so that portions of aggregate retained on specified intermediate sieves is substantially absent.
- gehlenite** — a mineral of the melilite group,  $\text{Ca}_2\text{Al}(\text{AlSi})\text{O}_7$ . (See also **melilite** and **merwinite**.)
- general contractor** — person or entity under contract with the owner, responsible for overseeing a construction project, providing the material, labor, equipment, and services necessary for the construction of the project.
- geopolymer** — an alternative cement produced from aluminosilicate precursors that form nonhydrated cementitious reaction products by alkali activation.
- geopolymerization** — a spontaneous reaction that results in the bonding of smaller inorganic polymers to form larger ones.
- Gillmore needle** — a device used in determining time of setting of hydraulic cement.
- girder** — a large beam, usually horizontal, that serves as a main structural member.
- glass-transition temperature** — the midpoint of the temperature range over which an amorphous material (such as glass or a high polymer) changes from (or to) a brittle, vitreous state to (or from) a plastic state.
- go-devil** — (1) a ball of rolled-up burlap or paper or a specially fabricated device put into the pump end of a pipeline and forced through the pipe by water pressure to clean the pipeline; (2) a device used with tremie concrete operations.
- grab setting** — see **flash setting** (preferred term).
- gradation** — see **grading** (preferred term).
- grade** — (1) the prepared surface on which a concrete slab is cast; (2) the process of preparing a plane surface of granular material or soil on which to cast a concrete slab.
- grade beam** — a reinforced-concrete beam, usually at ground level, that strengthens or stiffens the foundation or supports overlying construction.
- grade strip** — usually a thin strip of wood tacked to the inside surface of forms at the elevation to which the top of the concrete lift is to rise, either at a construction joint or the top of the structure.
- graded standard sand** — see **standard sand**.
- gradient** — rate of change in a variable over a distance.
- grading** — the distribution of particles of granular material among various sizes.
- grading curve** — a graphical representation of the proportions of different particle sizes in a granular material, obtained by plotting the cumulative or individual percentages of the material passing through sieves in which the aperture sizes form a given series.
- granolithic concrete** — concrete suitable for use as a wearing surface finish to floors, made with specially selected aggregate of suitable hardness, surface texture, and particle shape.

- granolithic finish** — a surface layer of granolithic concrete that may be laid on a base of either fresh or hardened concrete.
- granulated blast-furnace slag** — see **blast-furnace slag**.
- gravel** — aggregate retained on the 4.75 mm (No. 4) sieve and resulting either from natural disintegration and abrasion of rock or processing of weakly bound conglomerate. (See also **coarse aggregate**.)
- green concrete** — concrete that has undergone final setting but not hardened appreciably.
- grid foundation** — a combined footing formed by intersecting continuous footings, loaded at the intersection points, and covering much of the total area within the outer limits of the assembly.
- grinding** — intentional removal of a visually apparent amount of the surface paste to create a profile on the surface.
- grinding aids** — materials used to expedite the process of grinding by eliminating ball coating, dispersing the finely ground product, or both.
- grinding medium** — a hard, free-moving charge in a ball or tube mill to reduce the particle size of introduced materials by attrition or impact.
- grizzly** — a simple, stationary screen or series of equally spaced parallel bars set at an angle to remove oversized particles in processing aggregate or other material.
- grog** — burned refractory material, usually calcined clay or crushed brick bats.
- groove joint** — see **control joint** (preferred term).
- groover** — a tool used to form grooves or weakened-plane joints in a concrete slab before final setting to control crack location or provide pattern.
- ground wire** — small-gauge, high-strength steel wire used to establish line and grade as in shotcrete work (also called alignment wire and screed wire).
- ground-granulated blast-furnace slag** — (obsolete) see **slag cement** (preferred term).
- grout** — a mixture of cementitious material and water, with or without aggregate, and with or without admixtures.
- grout slope** — the natural slope of fluid grout injected into preplaced-aggregate concrete.
- grouted masonry** — unit masonry composed of either hollow units wherein the cells are filled with grout or multiple wythes where spaces between the wythes are filled with grout.
- grouted-aggregate concrete** — see **preplaced-aggregate concrete**.
- grouting** — the process of filling with grout. (See also **grout**.)
- gun** — (1) shotcrete material delivery equipment; (2) pressure cylinder used to propel freshly mixed concrete pneumatically.
- gun finish** — undisturbed final layer of shotcrete as applied from nozzle without hand finishing.
- Gunite** — a proprietary term for shotcrete.
- gunman** — workers on shotcreting crew who operates delivery equipment.
- gunning** — the act of applying dry-mix shotcrete.
- gypsum** — a mineral having the composition calcium sulfate dihydrate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ).
- gypsum plaster** — plaster made with plaster of paris. (See **plaster** and **plaster of paris**.)
- hairline crack** — a concrete surface crack with a width so small as to be barely perceptible.
- hairpin** — (1) the wedge used to tighten some types of form ties; (2) a hairpin-shaped anchor set in place before concrete reaches initial setting; (3) a light hairpin-shaped reinforcing bar used for shear reinforcement in beams, tie reinforcement in columns, or prefabricated column shear heads.
- Hamm tip** — (1) flared shotcrete nozzle having a larger diameter at midpoint than at either inlet or outlet; (2) designated premixing tip.
- hanger** — a device used to suspend one object from another object. (See also **form hanger**.)
- hard-burned lime** — the product of heating limestone to temperatures sufficient to change the calcium carbonate to calcium oxide, which can undergo expansion when it slowly reacts with water.
- hardened concrete** — concrete that has developed sufficient strength to serve a defined purpose or resist stipulated loading without failure.

- hardener** — (1) a chemical (including certain fluosilicates or sodium silicate) applied to concrete floors to reduce wear and dusting; (2) in a two-component adhesive or coating, the chemical component that causes the resin component to cure.
- hardening** — gain of strength and other properties of a cementitious mixture as a result of hydration after final setting.
- Hardy Cross method** — see **moment distribution**.
- harped tendons** — see **draped tendons** (preferred term).
- harsh mixture** — a concrete mixture that lacks desired workability due to a deficiency of mortar or aggregate fines.
- haunch** — a deepened portion of a beam in the vicinity of a support.
- hawk** — a tool used by plasterers to hold and carry plaster mortar; generally a flat piece of wood or metal approximately 10 to 12 in. (0.25 to 0.3 m) square with a wooden handle centered and fixed to the underside. (See also **hod** and **mortar board**.)
- hazardous material** — having one or more of the following characteristics: ignitable, corrosive, reactive, or toxic.
- hazardous material tank** — a tank used to collect, store, or treat hazardous material. A hazardous material tank usually provides either primary or secondary containment of a hazardous material.
- head** — a separate piece of steel of any shape firmly attached to the end of a bar or a protuberance of the bar itself at the end, used to anchor a steel reinforcing bar in concrete.
- head anchorage capacity** — the maximum force that can be transmitted from the head of the bar to the surrounding concrete.
- head bearing area** — area of the head projected onto a plane orthogonal to the longitudinal axis of the bar minus the bar cross sectional area, representing the contact surface between head and concrete where the bar tensile force is transferred through compression stress.
- headed bar** — a steel reinforcing bar that has steel head(s) on one or both ends with the purpose of anchoring the bar in concrete.
- header** — a masonry unit laid flat with its greatest dimension at a right angle to the face of the wall (when the unit is only the depth of the face wythe, it is known as a false header). (See also **bonder** and **wythe [leaf]**.)
- health hazard** — a chemical classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard.
- heat of hydration** — (1) heat evolved by chemical reactions with water; (2) the difference between the heat of solution of dry cement and that of partially hydrated cement. (See also **heat of solution**.)
- heat of solution** — heat evolved or absorbed when a substance is dissolved in a solvent.
- heat-deflection temperature** — the temperature at which a plastic material has an arbitrary deflection when subjected to an arbitrary load and test condition; this is an indication of the glass-transition temperature.
- heating rate** — the rate expressed in degrees per hour at which the temperature is raised to the desired maximum temperature.
- heavy concrete** — see **high-density concrete** (preferred term).
- heavy-media separation** — a method in which a liquid or suspension of given specific gravity is used to separate particles into a portion lighter than (those that float) and a portion heavier than (those that sink) the medium.
- heavyweight aggregate** — aggregate of high density, such as barite, magnetite, hematite, limonite, ilmenite, iron, or steel, used in heavyweight concrete.
- heavyweight concrete** — see **high-density concrete**.
- helical reinforcement** — see **spiral reinforcement** (preferred term).
- hematite** — a mineral, iron oxide (Fe<sub>2</sub>O<sub>3</sub>), used as aggregate in high-density concrete and in finely divided form as a red pigment in colored concrete.

- hemihydrate** — (1) a hydrate containing one-half molecule of water to one molecule of compound; (2) partially dehydrated gypsum (also known as plaster of paris),  $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ . (See also **bassanite** and **plaster of paris**.)
- hesitation setting** — see **false setting** (preferred term).
- Hessian** — see **burlap** (preferred term).
- high-alumina cement** — see **calcium-aluminate cement** (preferred term).
- high-density concrete** — concrete of substantially higher density than that made using normal-density aggregates, usually obtained by use of high-density aggregates and used especially for radiation shielding.
- high-discharge mixer** — see **inclined-axis mixer** (preferred term).
- high-early-strength cement** — portland cement characterized by attaining a given level of strength in mortar or concrete earlier than does normal portland cement (referred to as **ASTM C150/C150M Type III**).
- high-early-strength concrete** — concrete that, through the use of additional cement, high-early-strength cement, or admixtures, has accelerated early-age strength development.
- high-fineness cement** — a hydraulic cement of substantially higher specific surface and substantially smaller mean particle diameter than typical for products of similar composition produced by additional grinding or by separation by particle size.
- high-lift grouting** — a technique in masonry wall construction in which the grouting operation is delayed until the wall has been laid up to a full story height. (See also **low-lift grouting**.)
- high-performance concrete** — concrete meeting special combinations of performance and uniformity requirements that cannot always be achieved routinely using conventional constituents and normal mixing, placing, and curing practices.
- high-pressure steam curing** — see **autoclave curing** (preferred term).
- high-range water-reducing admixture** — a water-reducing admixture capable of producing large water reduction or great flowability without causing undue set retardation or entrainment of air in mortar or concrete.
- high-strength concrete** — concrete that has a specified compressive strength for design of 8000 psi (55 MPa) or greater.
- high-strength reinforcement** — see **high-strength steel**.
- high-strength steel** — steel with a high yield point (in the case of reinforcing bars 60,000 psi [414 MPa] and greater). (See also **prestressing steel**.)
- high-temperature steam curing** — see **atmospheric-pressure steam curing** and **autoclave curing**.
- hod** — a V-shaped trough or a tray, supported by a pole handle that is borne on the carrier's shoulder, for carrying small quantities of brick, tile, mortar, or similar load. (See also **hawk** and **mortar board**.)
- hold-down bolt** — anchor bolt provided near the ends of shear walls for transferring boundary-member loads from the shear wall to the foundation. (See also **anchor bolt**.)
- hollow-unit masonry** — masonry consisting of either entirely or partially hollow masonry units laid in mortar.
- honeycomb** — voids left in concrete between coarse aggregates due to inadequate consolidation.
- hook** — a bend in the end of a reinforcing bar.
- Hooke's law** — the law, for strains within the elastic limit, that the strain is proportional to the stress producing it. (See also **elastic limit** and **proportional limit**.)
- hooked bar** — a reinforcing bar with the end bent into a hook to provide anchorage.
- hoop reinforcement** — a closed or continuously wound tie, each having hooks meeting seismic detailing requirements.
- horizontal shoring** — metal or wood load-carrying strut, beam, or trussed section used to carry a shoring load from one bearing point, column, frame, post, or wall to another (may be adjustable).
- horizontal-shaft mixer** — a mixer having a stationary cylindrical mixing compartment, with the axis of the cylinder horizontal and one or more rotating horizontal shafts to which mixing blades or paddle are attached (also called a pugmill).
- hot cement** — newly manufactured cement that has not had an opportunity to cool after grinding of the clinker.

- hot face** — the surface of a refractory section exposed to the source of heat.
- hot-load test** — a test for determining the resistance to deformation or shear of a refractory material when subjected to a specified compressive load at a specified temperature for a specified time.
- Hoyer effect** — radial expansion of the prestress material due to its Poisson coefficient caused by the release of pretension.
- hydrate** — a chemical combination of water with another compound or an element.
- hydrated lime** — calcium hydroxide, a dry powder obtained by treating quicklime with water.
- hydration** — the chemical reaction between hydraulic cement and water forming new compounds most of which have strength-producing properties.
- hydraulic cement** — a binding material that sets and hardens by chemical reaction with water and is capable of doing so underwater. For example, portland cement and slag cement are hydraulic cements.
- hydraulic concrete structures** — structures such as dams, spillways, and bridge abutments designed to resist erosion caused by cavitation, abrasion, or chemical action.
- hydraulic hydrated lime** — the hydrated dry cementitious product obtained by calcining a limestone containing silica and alumina to a temperature short of incipient fusion so as to form sufficient free calcium oxide to permit hydration and at the same time leaving unhydrated sufficient calcium silicates to give the dry powder its hydraulic properties.
- hydraulic-cement grout** — a grout that is a mixture of hydraulic cement, aggregate, water, and possibly admixtures.
- hydromix nozzle** — a shotcrete hose and nozzle configuration used in place of a predampening system to introduce pressurized water into the material stream via a water ring.
- hydrous calcium chloride (CaCl<sub>2</sub>·2H<sub>2</sub>O)** — a solid, usually 77% calcium chloride, in flake form.
- ignition loss** — see **loss on ignition** (preferred term).
- ilmenite** — a mineral, iron titanate (FeTiO<sub>3</sub>), that, in pure or impure form, is commonly used as aggregate in high-density concrete.
- impact hammer** — see **rebound hammer** (preferred term).
- impending slough** — consistency of a shotcrete mixture containing the maximum amount of water such that the product will not flow or sag after placement.
- inclined-axis mixer** — a truck with a revolving drum that rotates about an axis inclined to the bed of the truck chassis.
- incrustation** — a crust or coating, generally hard, formed on the surface of concrete or masonry construction or on aggregate particles.
- indented wire** — wire having machine-made surface indentations intended to improve bond; depending on type of wire, used for either concrete reinforcement or pretensioning tendons.
- initial curing** — deliberate action taken between placement and final finishing of concrete to reduce the loss of water from the surface of the concrete.
- initial prestress** — the prestressing stress (or force) applied to the concrete at the time of stressing.
- initial setting** — a degree of stiffening of a cementitious mixture less than final set, generally stated as an empirical value indicating the time required for the cementitious mixture to stiffen sufficiently to resist, to an established degree, the penetration of a weighted test device. (See also **final setting**.)
- initial setting time** — the time required for a freshly mixed cement paste, mortar, or concrete to achieve initial setting. (See also **final setting time**.)
- initial stresses** — the stresses occurring in prestressed-concrete members before any losses occur.
- insert** — anything other than reinforcing steel that is rigidly positioned within a concrete form for permanent embedment in the hardened concrete.
- in-situ concrete** — see **cast-in-place concrete** (preferred term).
- insoluble residue** — the portion of a cement or aggregate that is not soluble in dilute hydrochloric acid of stated concentration.
- insulating concrete** — concrete having low thermal conductivity. (See also **lightweight concrete** and **low-density concrete**.)

- internal curing** — process by which the hydration of cement continues because of the availability of internal water that is not part of the mixing water.
- internal vibration** — see **vibration**.
- inverted L-beam** — a beam having a cross section in the shape of an inverted L. (See also **L-beam**.)
- inverted T-beam** — a beam having a cross section in the shape of an inverted T. (See also **T-beam**.)
- I-section** — beam cross section consisting of top and bottom flanges connected by a vertical web.
- isolation joint** — a separation between adjacent sections of a concrete structure to allow relative movement in three directions and through which all the bonded reinforcement is interrupted.
- jacking device** — (1) the device used to stress the tendons for prestressed concrete; (2) the device for raising a vertical slipform.
- jacking force** — in prestressed concrete, the temporary force exerted by the device that introduces tension into the tendons.
- jacking stress** — the maximum stress occurring in a prestressed tendon during stressing.
- jaw crusher** — a machine having two inclined jaws, one or both being actuated by a reciprocating motion so that the charge is repeatedly nipped between the jaws.
- jitterbug** — a grate tamper for pushing coarse aggregate slightly below the surface of a slab to facilitate finishing. (See also **tamper**.)
- joint** — (1) a physical separation in a concrete system, whether precast or cast-in-place, including cracks if intentionally made to occur at specified locations; (2) the region where structural members intersect.
- joint filler** — compressible material used to fill a joint to prevent the infiltration of debris and provide support for sealants applied to the joint.
- joint sealant** — compressible material used to exclude water and solid foreign materials from joints.
- joint spall** — a spall adjacent to a joint.
- jointed detail** — a connection where the bending stiffness differs from that of the members and requires special design to collect, transfer, and redistribute forces from one member to another through the connection.
- jointer (concrete)** — a metal tool used to cut a joint in fresh concrete.
- jointing** — the process of producing joints in a concrete slab.
- joint-sealing compound** — an impervious material used to fill joints in pavements or structures.
- joist** — a comparatively narrow beam used in closely spaced arrangements to support floor or roof slabs.
- kaolinite** — a common clay mineral having the general formula  $Al_2(Si_2O_5)(OH)_4$  and the primary constituent of kaolin.
- Kelly ball** — (1) an apparatus used for indicating the consistency of fresh concrete in accordance with ASTM C360 (withdrawn); (2) an apparatus used for determining suitability for load application in controlled low-strength material (CLSM) in accordance with [ASTM D6024/D6024M](#). (See also **ball test**.)
- kern area** — the area within a geometric shape in which a compressive force may be applied without tensile stresses resulting in any of the extreme fibers of the section.
- key** — see **keyway**.
- keyway** — a recess or groove in one lift or placement of concrete that is filled with concrete of the next lift, giving shear strength to the joint. (See also **tongue and groove**.)
- kick strip** — see **kicker**.
- kicker** — a wood block or board attached to a formwork member in a building frame or formwork to make the structure more stable.
- kiln** — a furnace or oven for drying, charring, hardening, baking, calcining, sintering, or burning various materials.
- lacing** — horizontal bracing between shoring members.

- lagging** — heavy sheathing used in underground work to withstand earth pressure. (See also **sheathing**.)
- laitance** — a layer of weak material derived from cementitious material and aggregate fines either: (1) carried by bleeding to the surface or to internal cavities of freshly placed mixture; (2) separated from the mixture and deposited on the surface or internal cavities during placement of the mixture.
- lap** — the length by which one bar or sheet of reinforcement overlaps another.
- lap splice** — a connection of reinforcing steel made by lapping the ends of bars.
- lapping (reinforcing steel)** — the overlapping of reinforcing steel bars, welded-wire reinforcement, or expanded metal so that there may be continuity of stress in the reinforcement when the concrete member is subjected to loading.
- lateral reinforcement** — transverse reinforcement usually applied to ties, hoops, and spirals used to enclose reinforcement in columns or column-like members.
- latex** — a dispersion of organic polymer particles in water.
- layer** — see **course** and **lift**.
- L-beam** — (1) a beam having a cross section in the shape of an L; (2) a beam having a ledge on one side only.
- leaf** — see **wythe (leaf)**.
- lean concrete** — concrete of low cementitious material content.
- lean mixture** — see **lean concrete**.
- ledger** — any member with a protrusion or protrusions that support other structural members. (See also **L-beam** and **inverted T-beam**.)
- length change** — increase or decrease in length. (See also **volume change** and **deformation**.)
- lever arm** — (1) in a structural member, the distance from the center of the tensile reinforcement to the center of action of the compression zone; (2) the perpendicular distance of a transverse force from a point about which moment is taken.
- licensed design professional** — (1) an engineer or architect who is licensed to practice structural design as defined by the statutory requirements of the professional licensing laws of a state or jurisdiction; (2) the architect or engineer, licensed as described, who is responsible for the structural design of a particular project (also historically engineer of record).
- lift** — the concrete placed between two consecutive horizontal construction joints, usually consisting of several layers or courses.
- lift joint** — surface at which two successive lifts meet.
- lift slab** — (1) a method of concrete construction in which floor and roof slabs are cast on or at ground level and hoisted into position by jacking; (2) a slab that is a component of such construction.
- lightweight aggregate** — aggregate of low density such as (1) expanded or sintered clay, shale, slate, diatomaceous shale, perlite, vermiculite, or slag; (2) natural pumice, scoria, volcanic cinders, tuff, and diatomite; (3) sintered fly ash or industrial cinders.
- lightweight concrete** — concrete containing lightweight aggregate and having an equilibrium density, as determined by ASTM C567, between 90 and 135 lb/ft<sup>3</sup>.
- lime** — specifically, calcium oxide (CaO), loosely, a general term for the various chemical and physical forms of quicklime, hydrated lime, and hydraulic hydrated lime. (See also **hydrated lime**, **hydraulic hydrated lime**, and **quicklime**.)
- limestone** — a sedimentary rock consisting primarily of calcium carbonate.
- limit design** — a method of proportioning reinforced-concrete members based on calculation of their strength. (See also **strength-design method**.)
- limonite** — an iron ore composed of a mixture of hydrated ferric oxides occasionally used in heavyweight concrete because of its high density and combined-water content, which contribute to its effectiveness in radiation shielding; a mineral occurring commonly as a constituent of particles of natural aggregate.

- linear transformation** — the method of altering the path of the prestressing tendon in any statically indeterminate prestressed structure by changing the location of the tendon at one or more interior supports without altering its position at the end supports and without changing the basic shape of the path between any supports (does not change the location of the path of the pressure line).
- linear-traverse method** — determination of the volumetric composition of a solid by integrating the distance traversed across areas of each component along a line or along regularly spaced lines in one or more planes intersecting a sample of the solid; frequently employed to determine characteristics of the air-void system in hardened concrete by microscopical examination along a series of traverse lines on finely ground sections of the concrete (also called the Rosiwal method). (See also **point count method** and **point count method [modified]**.)
- liner** — a very low-permeability barrier material that is used to prevent fluid (or gas) migration through the concrete. Liners may be bonded or mechanically attached to the concrete.
- lining** — any sheet, plate, or layer of material attached directly to the inside face of formwork to improve or alter the surface texture and quality of the finished concrete. (See also **form lining**, **tunnel lining**, and **sheathing**.)
- lintel** — a horizontal supporting member above an opening, such as a window or a door.
- live load** — (1) load that is not permanently applied to a structure but is likely to occur during the service life of the structure (excluding environmental loads); (2) loads meeting specific criteria found in the governing building code (without load factors).
- load balancing** — a technique used in the design of prestressed-concrete members in which the amount and path of the prestressing is selected so that the forces imposed upon the member or structure by the prestressing counteract or balance a portion of the dead and live loads for which the member or structure must be designed.
- load factor** — a factor by which a service load is multiplied to determine a factored load used in the strength-design method.
- load-bearing wall** — a wall designed and built to carry superimposed vertical loads, in-plane and shear loads, or both. (See also **nonbearing wall**.)
- long column** — a column whose load capacity is limited by buckling rather than strength. (See also **slender column**.)
- longitudinal bar** — see **longitudinal reinforcement** (preferred term).
- longitudinal crack** — a crack that develops parallel to the length of a member.
- longitudinal joint** — (1) a joint parallel to the length of a structure or pavement; (2) joint between adjacent segments in a ring with an axis parallel to the longitudinal axis of tunnel; also known as radial joint.
- longitudinal reinforcement** — reinforcement parallel to the length of a concrete member or pavement.
- Los Angeles abrasion test** — test for abrasion resistance of concrete aggregates.
- loss of prestress** — (1) the reduction in the prestressing force that results from the combined effects of slip at anchorage; (2) relaxation of steel stress; (3) frictional loss due to curvature in the tendons; (4) the effects of elastic shortening, creep, and shrinkage of the concrete.
- loss on ignition** — the percentage loss in mass of a sample ignited to constant mass at a specified temperature, usually 1650 to 1830°F (900 to 1000°C).
- low-alkali cement** — (1) a portland cement that contains a relatively small amount of sodium, potassium, or both; (2) in **ASTM C150/C150M**, a portland cement containing not more than 0.60% Na<sub>2</sub>O equivalent—that is, % Na<sub>2</sub>O + 0.658% K<sub>2</sub>O.
- low-carbon concrete** — concrete designed with reduced cradle-to-gate global warming potential compared to a benchmark.
- low-density concrete** — concrete having an oven-dry density of less than 50 lb/ft<sup>3</sup> (800 kg/m<sup>3</sup>). (See also **insulating concrete** and **lightweight concrete**.)
- low-heat cement** — a portland cement for use when a low heat of hydration is desired, referred to as **ASTM C150/C150M** Type IV cement.

- low-lift grouting** — a technique of masonry wall construction in which the wall sections are built to a height of not more than 5 ft (1.7 m) before the cells of the masonry units are filled with grout. (See also **high-lift grouting**.)
- low-pressure steam curing** — see **atmospheric-pressure steam curing** (preferred term).
- low-strength materials** — see **controlled low-strength material** (preferred term).
- machine-base grout** — a grout that is used in the space between plates or machinery and the underlying foundation and that is expected to maintain complete contact with the base and to maintain uniform support.
- macrofiber** — a fiber with an equivalent diameter greater than or equal to 0.012 in. (0.3 mm) for use in concrete.
- macroscopic** — visible to the naked eye.
- magnetite** — a mineral, ferrous ferric oxide ( $\text{FeO}\cdot\text{Fe}_2\text{O}_3$ ), the principal constituent of magnetic black iron ore with a density of approximately 5.2 g/cc (325 lb/ft<sup>3</sup>) and Mohs hardness of approximately 6 that is used as an aggregate in high-density concrete.
- manual batcher** — see **batcher** (1).
- manufactured sand** — see **sand**.
- map cracking** — intersecting cracks that extend below the surface of hardened concrete that vary in width from fine and barely visible to open and well-defined (also called pattern cracking). (See also **checking** and **crazing**.)
- marble** — a metamorphic rock composed essentially of recrystallized calcite, dolomite, or both.
- mason** — an artisan who builds with concrete masonry units, bricks, stone, and tile; name sometimes given to a concrete finisher.
- masonry** — construction composed of shaped or molded units, usually small enough to be handled by one person and composed of stone, ceramic brick or tile, concrete, glass, adobe, or the like.
- masonry cement** — a hydraulic cement used for masonry and plastering construction, containing one or more of the following materials: portland cement, portland-pozzolan cement, natural cement, slag cement, or hydraulic hydrated lime, and, in addition, usually contains one or more materials such as hydrated lime, limestone, chalk, calcareous shell, talc, slag, or clay as prepared for this purpose.
- masonry grout** — a mixture of hydraulic cement, aggregate, water, and possibly other materials (**ASTM C476**) used for filling designated spaces in masonry construction.
- masonry lift** — the height to which masonry is laid between periods of grouting.
- mass** — (1) the physical property of matter that causes it to have weight in a gravitational field; (2) the quantity of matter in a body.
- mass concrete** — any volume of structural concrete in which a combination of dimensions of the member being cast, the boundary conditions, the characteristics of the concrete mixture, and the ambient conditions can lead to undesirable thermal stresses, cracking, deleterious chemical reactions, or reduction in the long-term strength as a result of elevated concrete temperature due to heat from hydration.
- mass density** — see **density**.
- mat** — (1) an assembly of steel reinforcement composed of two or more layers of bars placed at angles to each other and secured together either by welding or tying; (2) a thin layer of randomly oriented chopped filaments, short fibers (with or without a carrier fabric), or long random filaments loosely held together with a binder and used as reinforcement for a fiber-reinforced polymer composite material.
- mat foundation** — a foundation consisting of a continuous concrete slab extending in both directions that is usually reinforced and supports an array of columns, walls, or both.
- material hose** — see **delivery hose**.

- matrix** — (1) the cement paste in which the fine aggregate particles in mortar are embedded; (2) the mortar in which the coarse aggregate particles in concrete are embedded; (3) the resin or binders that hold the fibers in fiber-reinforced polymer together, transfer load to the fibers, and protect them against environmental attack and damage due to handling.
- maturity factor** — a factor that is a function of the age of the concrete (hours or days) multiplied by the difference between the mean temperature of the concrete (degrees) during curing and a datum temperature below which hydration stops. (See also **temperature-time factor**.)
- maximum size (of aggregate)** — in specifications for and in description of aggregate, the smallest sieve opening through which the entire amount of aggregate is required to pass. (See also **nominal maximum size [of aggregate]**.)
- mean stress** — the average of the maximum and minimum stress in one cycle of fluctuating loading.
- mechanical anchorage** — any mechanical device capable of developing the specified yield strength of the reinforcement without damage to the concrete.
- mechanical bond** — interlock created when a fresh cementitious mixture is placed and hardens to conform to the surface texture of the existing solid material.
- mechanical connection** — the complete assembly of an end-bearing sleeve, a coupler, or a coupling sleeve, and possibly additional intervening material or other components to effect connection of reinforcing bars. (See also **bar-end check**, **coupler**, **coupling sleeve**, and **end-bearing sleeve**.)
- mechanical lap splice** — complete assembly of a coupling sleeve device and any additional components configured to accomplish positive splicing of overlapping reinforcing bars.
- megascopic** — see **macroscopic** (preferred term).
- melilite** — a group of minerals ranging from the calcium magnesium silicate (akermanite) to the calcium aluminate silicate (gehlenite) that occur as crystals in blast-furnace slag. (See also **gehlenite** and **merwinite**.)
- melt** — the molten portion of the raw material mass during the burning of cement clinker, firing of lightweight aggregates, or expanding of blast-furnace slags.
- membrane curing** — a process that involves the application of a liquid membrane-forming compound or covering with a protective sheet material, both of which function as a barrier to restrict evaporation of mixing water from concrete surfaces.
- membrane slab** — a slab-on-ground designed to be liquid-tight while having a designed thickness that results in a stiffness which allows for the capability of accepting gradual differential foundation settlements and transmit fluid loads directly to the subgrade.
- membrane theory** — a theory of design for thin shells, based on the premise that a shell cannot resist bending because it deflects; the only stresses that exist, therefore, in any section are shear stress and direct compression or tension.
- merwinite** — one of the principal crystalline phases found in blast-furnace slags. (See also **gehlenite** and **melilite**.)
- mesh reinforcement** — see **welded-wire reinforcement** and **woven-wire reinforcement**.
- mesh roller** — a finishing tool consisting of a rolling drum attached to a handle of which the surface of the drum is made of mesh, sometimes used for rolling over the surface of fresh concrete to embed coarse aggregate.
- Mesnager hinge** — a permanent semi-articulation or flexible joint in a reinforced-concrete arch wherein the angles of rotation at the hinge are very small; by crossing steel reinforcing bars within the opening between the concrete structural segments, the resultant articulation presents very small resistance to rotation, resists either axial thrust or shearing forces, and is permanently flexible; the center of rotation occurs at the intersection of the reinforcing bars.
- metakaolin** — a natural pozzolan produced by heating kaolin-containing clays.

- microconcrete** — a mixture of portland cement, water, and suitably graded sand for simulating concrete in small-scale structural models.
- microcracking** — the formation of numerous, microscopic cracks approximately 0.004 in. (0.1 mm) or less in width within concrete.
- microcracks** — small, numerous cracks that develop in hardened concrete.
- microfiber** — a fiber with an equivalent diameter less than 0.012 in. (0.3 mm) for use in concrete.
- microscopic** — discernible only with the aid of a microscope.
- microsilica** — see **silica fume** (preferred term).
- microtopping** — bonded decorative overlay usually 1/8 to 3/16 in. (3 to 5 mm) in thickness.
- middle strip** — in two-way slab framing, the slab portion that occupies the middle half of the span between columns.
- mill scale** — the partially adherent layers of oxidation products (heavy oxides) developed on metallic surfaces during either hot fabrication or heat treatment of metals, as on hot-rolled steel reinforcing bars.
- mineral aggregate** — aggregate consisting essentially of inorganic nonmetallic rock materials, either natural or crushed and graded.
- mineral filler** — a finely divided mineral product at least 65% of which passes the 75  $\mu\text{m}$  (No. 200) sieve. (See also **silt**.)
- minimum film-forming temperature** — the minimum temperature at which a synthetic latex or emulsion will coalesce when laid on a substrate as a thin film.
- mix (*n.*)** — see **mixture**.
- mix design** — see **mixture proportion** (preferred term).
- mixer** — a machine used for blending the constituents of concrete, grout, mortar, cement paste, or other mixture.
- mixer efficiency** — the adequacy of a mixer in rendering a homogeneous product within a stated period.
- mixing cycle** — the time taken for a complete cycle in a batch mixer—that is, the time elapsing between successive repetitions of the same operation (for example, successive discharges of the mixer).
- mixing plant** — see **batch plant** (preferred term).
- mixing speed** — rotation rate of a mixer drum or of the paddles in an open-top, pan, or trough mixer when mixing a batch, expressed in revolutions per minute (rpm) or in peripheral feet per minute (meters per minute) of a point on the circumference at maximum diameter.
- mixing time** — the period during which the constituents of a batch of concrete are mixed by a mixer; for a stationary mixer, time is given in minutes from the completion of mixer charging until the beginning of discharge; for a truck mixer, time is given in total minutes at a specified mixing speed or expressed in terms of total revolutions at a specified mixing speed. (See also **amount of mixing**.)
- mixing water** — the water in freshly mixed cementitious mixtures, exclusive of any previously absorbed by the aggregate (also called batch water or batched water.) (See also **water-cement ratio** and **surface moisture**.)
- mixture** — (1) the assembled, blended, commingled ingredients of mortar, concrete, or the like; (2) the proportions for their assembly.
- mixture proportion** — the proportions of ingredients that make the most economical use of available materials to produce mortar or concrete of the required properties. (See also **proportion**.)
- mobile placer** — a small belt conveyor mounted on wheels or a truck that can be readily moved to the job site for conveying concrete from the concrete truck to the forms or slab.
- mobility** — the ability of fresh concrete or mortar to flow.
- moderate exposure condition** — an environment, normally in temperate climate regions, in which concrete will only occasionally be exposed to moisture and will not be saturated before freezing and where no deicing agents or other aggressive chemicals are used.

- moderate sulfate-resisting cement** — a portland cement for use when either moderate sulfate resistance, moderate heat of hydration, or both is desired; now referred to as [ASTM C150/C150M](#) Type II cement.
- modified cement** — (obsolete) a portland cement for use when either moderate heat of hydration, moderate sulfate resistance, or both, is desired; now referred to as [ASTM C150/C150M](#) Type II cement.
- modified cube** — a portion of a rectangular beam of hardened concrete previously broken in flexure, used in determining the compressive strength of the concrete.
- modified portland cement** — (obsolete) a portland cement having moderate heat of hydration; this term was replaced by [ASTM C150/C150M](#) Type II cement beginning in 1960. (See also **modified cement**.)
- modular ratio** — the ratio of modulus of elasticity of steel  $E_s$  to that of concrete  $E_c$ , usually denoted by the symbol  $n$ .
- modulus of resilience** — see **resilience**.
- modulus of rupture** — the flexural stress in the extreme tension fiber of a plain concrete beam test specimen calculated from the maximum applied load measured in accordance with a standard test method. (See also **flexural strength**.)
- modulus 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/D1196M](#) (also called coefficient of subgrade reaction).
- Mohs scale** — relative scale of the hardness of minerals ranging from 1 through 10.
- moist cabinet** — an upright and compartmented case having doors and shelves of moderate dimensions for storing and curing small test specimens of cement paste, mortar, and concrete in an atmosphere of approximately 73°F (23°C) and at least 95% relative humidity. (See also **moist room**.)
- moist room** — a room with controlled temperature and relative humidity for the purpose of curing and storing cementitious test specimens (also called a fog room).
- moisture barrier** — see **vapor barrier**.
- moisture content of aggregate** — the ratio expressed as a percentage of the mass of water in a given quantity of aggregate to the dry mass of that quantity of aggregate.
- moisture-free** — the condition of a material that has been dried in air until there is no further significant change in its mass. (See also **mass**.)
- mold** — (1) a device containing a cavity into which neat cement, mortar, or concrete test specimens are cast; (2) a form used in the fabrication of precast mortar or concrete units (for example, masonry units).
- moment distribution** — a method of structural analysis for continuous beams and rigid frames whereby successive converging corrections are made to an assumed set of moments until the desired precision is obtained (also called the Hardy Cross method).
- monolithic concrete** — concrete cast with no joints other than construction joints.
- monolithic surface treatment** — see **dry-shake**.
- monolithic topping** — on flatwork, a higher quality, more serviceable topping course placed promptly after the base course has lost all slump and bleed water.
- monomolecular** — composed of single molecules; specifically, films that are one molecule thick; denotes a thickness equal to one molecule; for example, certain chemical compounds develop a monomolecular film over bleeding water at the surface of freshly placed concrete or mortar as a means of reducing the rate of evaporation. (See also **evaporation retardant**.)
- montmorillonite** — a swelling clay mineral of the smectite group; main constituent of bentonite. (See also **smectite**.)
- mortar** — a mixture of cement paste and fine aggregate; in fresh concrete, the material occupying the interstices among particles of coarse aggregate; in masonry construction, joint mortar may contain masonry cement, or may contain hydraulic cement with lime (and possibly other admixtures) to afford greater plasticity and workability than are attainable with standard portland cement mortar. (See also **hydraulic cement** and **masonry**.)
- mortar board** — a platform or tray for holding freshly mixed mortar. (See also **hawk** and **hod**.)
- mortar flow** — see **flow** (2).

- mosaic** — inlaid exposed surface designs of aggregates or other material.
- mottling** — uneven color shading or blotchiness across a surface. (See also **discoloration**.)
- moving forms** — large, prefabricated units of formwork incorporating supports and designed to be moved horizontally on rollers or similar devices with a minimum amount of dismantling between successive uses.
- mud mat** — a layer of concrete beneath a structural concrete floor or footing over soft, wet soil.
- mud pumping** — see **pumping (of pavements)**.
- mudjacking** — see **slab-jacking** (preferred term).
- multi-element prestressing** — prestressing accomplished by stressing an assembly of several individual structural elements as a means of producing one integrated structural member.
- nailer** — a strip of wood or other fitting attached to or set in concrete or attached to steel to facilitate making nailed connections.
- natural cement** — a hydraulic cement produced by calcining an argillaceous limestone at a temperature below the sintering point and then grinding to a fine powder.
- natural pigment** — the class of pigments that are produced by physical processing of materials mined directly from the earth (also called natural or mineral pigments or colors).
- natural pozzolan** — a raw or calcined natural material that has pozzolanic properties.
- natural sand** — sand resulting from natural disintegration and abrasion of rock. (See also **sand** and **fine aggregate**.)
- neat cement grout** — a fluid mixture of hydraulic cement and water with or without other ingredients.
- neat cement paste** — a mixture of hydraulic cement and water.
- neat plaster** — plaster without sand.
- negative moment** — a condition of flexure in which top fibers of a horizontally placed member, or external fibers of a vertically placed exterior member, are subjected to tensile stresses.
- negative reinforcement** — steel reinforcement for negative moment.
- net cross-sectional area (of masonry)** — the gross cross-sectional area of a section of masonry minus the area of cavities, cells, or cored spaces.
- net mixing water** — see **mixing water**.
- neutral axis** — a line in the plane of a structural member subject to bending where the longitudinal stress is zero.
- neutral refractory** — a refractory that is resistant to chemical attack by either acidic or basic substances.
- no-fines concrete** — a concrete mixture containing little or no fine aggregate. (See **pervious concrete**.)
- nodal zone** — volume of concrete around a node that is assumed to transfer strut-and-tie forces through the node.
- node** — point in a strut-and-tie model where the axes of the struts, ties, and concentrated forces acting on the joint intersect.
- nominal flexural strength** — the flexural strength of a member or cross section calculated in accordance with provisions and assumptions of the strength-design method before application of any strength reduction factor ( $\phi$ ).
- nominal maximum size (of aggregate)** — in specifications for and in descriptions of aggregate, the smallest sieve opening through which the entire amount of the aggregate is permitted to pass. (See also **maximum size [of aggregate]**.)
- nominal shear strength** — the shear strength of a member or cross section calculated in accordance with provisions and assumptions of the strength-design method before application of any strength reduction factor ( $\phi$ ) factor.
- nominal size** — see **nominal maximum size (of aggregate)**.
- nominal strength** — strength of a member or cross section calculated in accordance with provisions and assumptions of the strength design method before application of any strength reduction factor ( $\phi$ ).

- nominal strength reduction factor** — the factor by which the nominal strength is multiplied to obtain the design strength.
- nonagitating unit** — a truck-mounted container for transporting central-mixed concrete not equipped to provide agitation (slow mixing) during delivery.
- non-air-entrained concrete** — concrete in which neither an air-entraining admixture nor air-entraining cement has been used.
- nonbearing wall** — a wall that supports no vertical load other than its own weight and no in-plane shear loads. (See also **load-bearing wall**.)
- noncombustible** — any material that neither ignites nor supports combustion in air when exposed to fire.
- nondestructive testing** — operator-controlled process of measuring structural and material properties of a system that causes no structurally significant damage to the concrete.
- nonevaporable water** — the water that is chemically combined during cement hydration. (See also **evaporable water**.)
- nonferrous** — relating to metals other than iron, not containing or including iron.
- nonprestressed reinforcement** — reinforcing steel not subjected to either pretensioning or post-tensioning.
- nonrecoverable creep** — the residual or nonreversible deformation remaining in hardened concrete after removal of sustained load.
- nontilting mixer** — a horizontal rotating drum mixer that charges, mixes, and discharges without tilting.
- nonvolatile content** — the portion of a material that remains after volatile matter has been evaporated under specified ambient or accelerated conditions.
- normal cement** — general purpose portland cement, referred to as [ASTM C150/C150M](#) Type I cement.
- normal consistency** — the consistency of cement paste satisfying appropriate limits defined in a standard test method, for example, [ASTM C187](#).
- normal portland cement** — see **normal cement**.
- normal stress** — the stress component that is perpendicular to the plane on which the force is applied, designated tensile if the force is directed away from the plane and compressive if the force is directed toward the plane. (See also **stress**.)
- normalweight aggregate** — aggregate that is neither heavyweight nor lightweight.
- normalweight concrete** — concrete having a density of approximately 150 lb/ft<sup>3</sup> (2400 kg/m<sup>3</sup>) made with normal-density aggregates.
- no-slump concrete** — freshly mixed concrete exhibiting a slump of less than 1/4 in. (6 mm). (See also **zero-slump concrete**.)
- nozzle** — a metal or rubber tip attached to the discharge end of a heavy thick-walled rubber hose from which a continuous stream of shotcrete is ejected at high velocity.
- nozzle body** — device at the end of the delivery hose that has a regulating valve and contains a manifold (water or air ring) to introduce water or air into the shotcrete mixture; a nozzle tip is attached to the exit end of the nozzle body
- nozzle liner** — a replaceable rubber lining fitted into the nozzle tip to prevent abrasion of the interior surface of the nozzle.
- nozzle velocity** — the rate at which shotcrete is ejected from the nozzle.
- obsidian** — a natural volcanic glass of relatively low water content, usually of rhyolite composition. (See also **perlite**.)
- offset** — (1) an abrupt change in alignment or dimension, either horizontally or vertically; (2) a horizontal ledge occurring along a change in wall thickness of the wall above.
- offset bend** — (1) an intentional distortion from the normal straightness of a steel reinforcing bar to move the centerline of a segment of the bar to a position parallel to the original position of the center line; (2) a mechanical operation commonly applied to vertical bars that reinforce concrete columns.
- offset yield strength** — the stress at which the strain exceeds, by a specified amount, an extension of the initially proportional part of the stress-strain curve.
- oil-well cement** — hydraulic cement suitable for use under high pressure and temperature in sealing water and gas pockets and setting casing during the drilling and repair of wells, and often contains retarders to meet the requirements of use.

- one-way system** — the arrangement of steel reinforcement within a slab that presumably bends in only one direction.
- opal** — a mineral composed of amorphous hydrous silica ( $\text{SiO}_2 \cdot n\text{H}_2\text{O}$ ).
- opaline chert** — chert composed entirely or mainly of opal.
- open-graded aggregate** — aggregate where the voids between the particles are relatively large when compacted.
- open-top mixer** — a truck-mounted mixer consisting of a trough or a segment of a cylindrical mixing compartment within which paddles or blades rotate about the horizontal axis of the trough. (See also **horizontal-shaft mixer**.)
- ordinary portland cement** — the term used in the United Kingdom and elsewhere to designate the equivalent to **ASTM C150/C150M** Type I cement.
- orthotropic** — a hypothetical plate consisting of beams and a slab acting together with different flexural rigidities in the longitudinal and transverse directions, as in a composite beam bridge. (This term is a contraction of the terms “orthogonal anisotropic” as in the phrase “orthogonal anisotropic plate.”)
- outlet** — tubing or duct to allow the escape of air, water, grout, and bleed water from the duct; includes a positive shutoff.
- owner’s representative** — person or entity authorized to act on the owner’s behalf.
- oven-dry** — the condition resulting from having been dried to essentially constant mass in an oven at a temperature that has been fixed.
- oven-dry specific gravity** — the ratio of the mass of a volume of a material (including the permeable and impermeable pores in the material but not including the voids between particles of the material) at a stated temperature to the mass of an equal volume of distilled water at a stated temperature. (Historically called bulk specific gravity.)
- overlay** — a layer of concrete or mortar placed on a concrete slab to either restore or improve the function of the previous surface.
- oversanded** — containing more sand than would be necessary to produce adequate workability and a satisfactory condition for finishing.
- overspray** — shotcrete material deposited away from intended receiving surface.
- overvibration** — excessive use of vibrators during placement of freshly mixed concrete, causing segregation, stratification, and excessive bleeding.
- owner** — the corporation, association, partnerships, individual, or public body or authority with whom the contractor enters into an agreement and for whom the work is provided.
- pack setting** — see **sticky cement** and **warehouse setting**.
- packaged concrete, mortar, or grout** — mixtures of dry ingredients in packages, requiring only the addition of the recommended amount of water to produce concrete, mortar, or grout.
- packer** — a device inserted into a hole in which grout is to be injected that acts to prevent return of the grout around the injection pipe, usually an expandable device actuated mechanically, hydraulically, or pneumatically.
- packerhead process** — a process for producing concrete pipe that uses a rotating device that forms the interior surface of the pipe as concrete is fed into the form from above. (See also **centrifugal process**, **dry-cast process**, **tamp process**, and **wet-cast process**.)
- paddle mixer** — see **open-top mixer** (preferred term).
- pan** — (1) a prefabricated form unit used in concrete joist floor construction; (2) a container that receives particles passing the finest sieve during sieve analysis of granular materials.
- pan mixer** — see **vertical-shaft mixer** (preferred term).
- panel** — (1) a section of form sheathing that can be erected and stripped as a unit; (2) a concrete element that is relatively thin with respect to other dimensions and is bordered by joints or edges; (3) a region of a suspended slab system bounded by column, beam, or wall centerlines.
- panel strip** — a strip extending across the length or width of a flat slab for structural design and construction or for architectural purposes.
- parapet** — (1) the part of a wall that extends above the roof level; (2) a low wall along the top of a dam.

- parge** — to coat with plaster, particularly foundation walls and rough masonry. (See also **back plastering**.)
- partial prestressing** — prestressing to a stress level such that, under design loads, tensile stresses exist in the precompressed tensile zone of the prestressed member.
- particle shape** — the form of a particle. (See also **elongated piece [of aggregate]**, and **flat piece [of aggregate]**.)
- particle-size distribution** — see **grading**.
- parting agent** — see **release agent** (preferred term).
- pass** — layer of shotcrete placed in one movement over the area of operation.
- paste** — see **neat cement paste**.
- paste content** — amount of cement paste in concrete, mortar, or the like, expressed as volume percent of the entire mixture. (See also **neat cement paste**.)
- paste volume** — see **paste content**.
- pattern cracking** — see **crack**, **craze cracks**, and **map cracking**.
- pattern cracks** — see **crack**, **craze cracks**, and **map cracking**.
- patterned ashlar** — see **ashlar masonry**.
- pavement (concrete)** — a layer of concrete on such areas as roads, sidewalks, canals, playgrounds, and those used for storage or parking. (See also **rigid pavement**.)
- pavement slab** — slab-on-ground designed to be liquid-tight and for vehicle or other concentrated loads.
- paving train** — an assemblage of equipment designed to place and finish a concrete pavement.
- pea gravel** — screened gravel, most of the particles of which pass a 9.5 mm (3/8 in.) sieve and are retained on a 4.75 mm (No. 4) sieve.
- peak load** — the highest load sustained by a specimen or structural element during a test.
- peak load strength** — strength computed using the peak load.
- pedestal** — compression member with a ratio of height-to-least lateral dimension less than or equal to 3.
- peeling** — a process in which thin flakes of mortar are broken away from a concrete surface, such as by deterioration or by adherence of surface mortar to forms as forms are removed.
- pencil rod** — plain metal rod of approximately 1/4 in. (6 mm) diameter.
- penetrability** — a general term related to the ease of fluid penetration into concrete, which may occur by permeation, absorption, diffusion, or a combination thereof.
- penetration** — an opening through which pipe, conduit, or other item passes through a wall or floor.
- penetration probe** — a device for obtaining an indirect measure of the concrete compressive strength by measuring the resistance of concrete to penetration, customarily determined by the distance that a steel pin is driven into the concrete from a special gun by a precisely measured explosive charge.
- penetration resistance** — (1) the resistance of fresh mortar or cement paste to penetration by a plunger or needle under standard conditions used to determine time of setting; (2) the resistance of hardened concrete to penetration by a steel rod driven into the surface by a high-powered driver.
- percent fines** — (1) the amount, expressed as a percentage, of material in aggregate finer than a given sieve, usually the 75  $\mu\text{m}$  (No. 200); (2) the amount of fine aggregate in a concrete mixture expressed as a percent by absolute volume of the total amount of aggregate.
- percentage of reinforcement** — the ratio of cross-sectional area of reinforcing steel to the effective cross-sectional area of a member, expressed as a percentage.
- performance-based specification** — a specification in which the requirements are stated in terms of required results with criteria for verifying compliance rather than specific composition, design, or procedure.
- periclase** — a crystalline mineral, magnesia (MgO), the equivalent of which may be present in portland-cement clinker, portland cement, and other materials such as open-hearth slags and certain basic refractories.

- perlite** — a volcanic glass having a perlitic structure, usually having a higher water content than obsidian and, when expanded by heating, used as an insulating material and as a lightweight aggregate in concretes, mortars, and plasters.
- permanent setting** — inelastic elongation or shortening.
- permeability** — the ability of a given concrete to permit liquids or gases to pass through.
- pervious concrete** — concrete containing little, if any, fine aggregate that results in sufficient voids to allow air and water to pass easily from the surface to underlying layers.
- pervious pavement** — a pavement comprising material with sufficient continuous voids to allow water to pass from the surface to the underlying layers.
- petrography** — (1) the branch of petrology dealing with description and systematic classification of rocks aside from their geologic relations, mainly by laboratory methods, largely chemical and microscopical (also, loosely, petrology or lithology); (2) laboratory study of concrete and mortar samples to determine various characteristics including, but not limited to, w/c, paste-aggregate bond, and air content.
- petrology** — the science of rocks, treating of their origin, structure, and composition from aspects and in all relations. (See also **petrography**.)
- phenolic resin** — a class of synthetic, oil-soluble resins (plastics) produced as condensation products of phenol, substituted phenols and formaldehyde, or some similar aldehyde that may be used in paints for concrete.
- phi ( $\phi$ ) factor** — see **nominal strength reduction factor** (preferred term).
- Philleo factor** — a distance, used as an index of the extent to which hardened cement paste is protected from the effects of freezing, so selected that only a small portion of the cement paste (usually 10%) lies farther than that distance from the perimeter of the nearest air void. (See also **protected paste volume**.)
- physical salt attack** — mechanism in which concrete or mortar is damaged as a result of salt crystallization pressure, with the salts usually originating from soil or groundwater.
- pier** — (1) a slender isolated foundation member of either plain or reinforced concrete that is cast on end in the ground; (2) an isolated vertical masonry member whose horizontal dimension measured at right angles to its thickness is not less than three times its thickness nor greater than six times its thickness and whose height is less than five times its length.
- pier cap** — a structural member at the top of a pier or group of piers placed, usually separately, to accommodate deviations from desired position, to facilitate placement of anchors or dowels, or to combine two or more piers into a unit to support other structural members.
- pigment** — a coloring matter, usually in the form of an insoluble fine powder.
- pilaster** — column built with a wall, usually projecting beyond the wall.
- pile** — a slender structural element that is driven, jettted, or otherwise embedded on end in the ground to support a load or compact the soil. (See also **composite pile**.)
- pile bent** — two or more piles driven in a row transverse to the long dimension of the structure and fastened together by capping and (sometimes) bracing.
- pile cap** — a concrete element that transfers load from a column or pedestal to the top of one or more supporting piles.
- pipe column** — column made of steel pipe, often filled with concrete.
- pipe pile** — a steel pipe generally driven with open ends to firm bearing and then excavated and filled with concrete.
- pitting** — development of relatively small cavities in a surface; in concrete, localized disintegration, such as a popout; in steel, localized corrosion evident as minute cavities on the surface.
- placeability** — see **workability**.
- placement** — (1) the process of placing and consolidating concrete; (2) a quantity of concrete placed and finished during a continuous operation (often inappropriately referred to as pouring).

- placing** — the deposition, distribution, and consolidation of freshly mixed concrete in the place where it is to harden (often inappropriately referred to as pouring).
- plain bar** — a reinforcing bar without surface deformations, or one having deformations that do not conform to the applicable requirements.
- plain concrete** — structural concrete with no reinforcement or with less reinforcement than the minimum amount specified for reinforced concrete in the applicable building code.
- plain masonry** — (1) masonry without reinforcement; (2) masonry reinforced only for shrinkage or thermal change.
- plain pavement** — unreinforced concrete pavement.
- plane of weakness** — the plane along which a body under stress will tend to fracture and which may exist by design, by accident, or because of the nature of the structure and its loading.
- plaster** — (1) a mixture consisting essentially of a cementitious material or materials, fine aggregate, and water that forms a cohesive and workable mass; (2) the act of placing such material. (See also **stucco**.)
- plaster of paris** — gypsum,  $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ , from which three-fourths of the chemically bound water has been driven off by heating. (See also **hemihydrate** and **bassanite**.)
- plastic** — possessing certain degree of plasticity. (See also **plasticity**.)
- plastic cement** — a cement manufactured for plaster and stucco applications consisting of a blend of cement and lime that may include pozzolans, fillers, or additives to increase plasticity, workability, and crack resistance of the cement and the plaster.
- plastic consistency** — the consistency at which a mixture subjected to a constant shearing stress undergoes increasing deformation without rupture.
- plastic flow** — see **creep** and **stress relaxation**.
- plastic hinge** — region where ultimate moment capacity in a member may be developed and maintained with corresponding significant inelastic rotation as main tensile steel elongates beyond yield strain.
- plastic shrinkage** — shrinkage that takes place before cement paste, mortar, grout, or concrete sets.
- plasticity** — the property of freshly mixed cement paste, concrete, or mortar that determines its resistance to deformation or ease of molding.
- plasticity index (PI)** — the range of water content in which a soil remains plastic, evaluated as the numerical difference between liquid limit and plastic limit, as calculated according to [ASTM D4318](#) (also called plasticity).
- plasticizer** — (1) a material that increases the plasticity of a fresh cementitious mixture; (2) a substance added to a material to improve the material's flexibility.
- plastic-shrinkage crack** — surface crack that occurs in concrete before initial set.
- plumb** — vertical or to make vertical.
- pneumatically applied mortar** — see **shotcrete**.
- point count method** — method for determination of the volumetric composition of a solid by observation of the frequency with which areas of each component coincide with a regular system of points in one or more planes intersecting a sample of the solid. (See also **linear-traverse method**.)
- point count method (modified)** — the point count method supplemented by a determination of the frequency with which areas of each component of a solid are intersected by regularly spaced lines in one or more planes intersecting a sample of the solid.
- point load** — a load whose area of contact with the resisting body is negligible in comparison with the area of the resisting body.
- point of contraflexure** — see **point of inflection** (preferred term).
- point of inflection** — the point on the length of a structural member subjected to flexure where the bending moment is zero and the curvature changes from concave to convex or convex to concave (also called point of contraflexure).
- Poisson's ratio** — the absolute value of the ratio of transverse strain to the corresponding longitudinal strain resulting from uniformly distributed axial stress below the proportional limit of the material.

- polarizing microscope** — a microscope equipped with elements permitting observations and determinations to be made using polarized light.
- polish or final grind** — the final operation in which fine abrasives are used to hone a surface to its desired smoothness and appearance.
- polished concrete** — post-placement architectural finish or texturing technique where concrete undergoes sequential mechanical abrasion resulting in full surface refinement.
- polyethylene** — a thermoplastic high-molecular-weight organic compound used in formulating protective coatings or, in sheet form, as a protective cover for concrete surfaces during the curing period, or to provide a temporary enclosure for construction operations.
- polymer** — the product of polymerization or, more commonly, a rubber or resin consisting of large molecules formed by polymerization.
- polymer concrete** — concrete in which an organic polymer serves as the binder.
- polymer-cement concrete** — a mixture comprising hydraulic cement and aggregate combined at the time of mixing with organic monomers or polymers that are dispersed in water.
- polymer-impregnated concrete** — a hydrated hydraulic-cement concrete that has been impregnated with a monomer that is subsequently polymerized.
- polymerization** — the reaction in which two or more molecules of the same substance combine to form a compound containing the same elements and in the same proportions but of higher molecular weight.
- polystyrene resin** — synthetic resins, varying from colorless to yellow, formed by the polymerization of styrene on heating with or without catalysts, which may be used in paints for concrete, for making sculptured molds, or as insulation.
- polyurethane** — reaction product of an isocyanate with any of a wide variety of other compounds containing an active hydrogen group, also used to formulate tough, abrasion-resistant coatings.
- polyvinyl chloride** — a synthetic resin prepared by the polymerization of vinyl chloride, used in the manufacture of nonmetallic waterstops for concrete.
- ponding** — (1) the creation and maintaining of a shallow pond of water on the surface of a concrete slab to assist curing; (2) accidental or incidental occurrence of a shallow pond or ponds on a nominally flat surface of concrete; (3) a condition in which a horizontal slab deforms downward between supports.
- popout** — the breaking away of small portions of a concrete, mortar, and plaster surface due to localized internal pressure that leaves a shallow, typically conical, depression.
- porosity** — the ratio, usually expressed as a percentage of the volume of voids in a material to the total volume of the material including the voids.
- portland blast-furnace slag cement** — a hydraulic cement consisting of an intimately interground mixture of portland-cement clinker and granulated blast-furnace slag or an intimate and uniform blend of portland cement and fine granulated blast-furnace slag in which the amount of the slag constituent is within specified limits.
- portland cement** — a hydraulic cement produced by pulverizing portland-cement clinker and usually with addition of calcium sulfate to control setting.
- portland-cement clinker** — a partially fused product of kiln that is ground to make cement.
- portland-cement concrete** — see **concrete**.
- portlandite** — a crystalline calcium hydroxide (Ca(OH)<sub>2</sub>).
- portland-pozzolan cement** — a 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 pozzolan constituent is within specified limits.
- position coupler** — threaded device for joining reinforcing bars where bars are not rotated.

- positive moment** — a condition of flexure in which, for a horizontal simply supported member, the deflected shape is normally considered to be concave downward and the top fibers subjected to compression stresses (for other members and other conditions, consider positive and negative as relative terms). (See also **negative moment**.) Note: for structural design and analysis, moments may be designated as positive or negative with satisfactory results as long as the sign convention adopted is used consistently.
- positive reinforcement** — reinforcement for positive moment.
- post** — vertical formwork member used as a support (also called shore, prop, and jack).
- post shore** — individual vertical member used to support loads.
- (1) *adjustable timber single-post shore* — individual timber used with a fabricated clamp to obtain adjustment and not normally manufactured as a complete unit.
- (2) *fabricated single-post shore* — Type I: single all-metal post with a fine-adjustment screw or device in combination with pin-and-hole adjustment or clamp; Type II: single or double wooden post members adjustable by a metal clamp or screw and usually manufactured as a complete unit.
- (3) *timber single-post shore* — timber used as a structural member for shoring support.
- post-tensioning** — method of prestressing in which prestressing steel is tensioned after concrete has hardened.
- pot life** — time interval after mixing of thermosetting resin and initiators during which the mixture can be applied without degrading the final performance of the resulting polymer beyond specified limits.
- pouring (of concrete)** — see **placement** and **placing**.
- power float** — see **rotary float** (preferred term).
- Powers' spacing factor** — see **spacing factor** (preferred term).
- pozzolan** — a siliceous or silico-aluminous material that will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds having cementitious properties (there are both natural and artificial pozzolans).
- pozzolanic** — of or pertaining to a pozzolan.
- pozzolanic reaction** — reaction between calcium hydroxide and the oxides in a pozzolan, resulting in reaction products having cementitious properties similar to the products that result from the hydration of portland cement.
- pozzolanic-activity index** — an index that measures pozzolanic activity based on the strength of cementitious mixtures containing hydraulic cement with and without the pozzolan, or containing the pozzolan with lime.
- preblended grout** — a hydraulic-cement grout that is a commercially available mixture of hydraulic cement, aggregate, and other ingredients that requires only the addition of water and mixing at the job site (also called premixed grout).
- precast concrete** — concrete cast elsewhere than its final position.
- precast pile** — a reinforced pile manufactured in a casting plant or at the site but not in its final position. (See also **cast-in-place pile**.)
- precompressed zone** — the area of a flexural member that is compressed by the prestressing tendons.
- prefire** — to raise the temperature of refractory concrete under controlled conditions before placing it in service.
- preformed foam** — foam produced in a foam generator before introduction of the foam into a mixer with other ingredients to produce cellular concrete. (See also **cellular concrete**.)
- premature stiffening** — see **early stiffening** (preferred term).
- preplaced-aggregate concrete** — concrete produced by placing coarse aggregate in a form and later injecting a portland cement-sand grout, usually with admixtures, to fill the voids.
- pre-post-tensioning** — a method of fabricating prestressed concrete in which some of the tendons are pretensioned and a portion of the tendons are post-tensioned.
- preservation** — the process of maintaining a structure in its present condition and arresting further deterioration. (See also **rehabilitation**, **repair**, and **restoration**.)

- preset period** — see **presteaming period** (preferred term).
- preshrunk concrete (mortar or grout)** — (1) concrete that has been mixed for a short period in a stationary mixer before being transferred to a transit mixer; (2) grout, mortar, or concrete that has been mixed 1 to 3 hours before placing to reduce shrinkage during hardening.
- pressed edge** — edge of a footing along which the greatest soil pressure occurs under conditions of overturning.
- presteaming period** — in the manufacture of concrete products, the time between molding of a concrete product and start of the temperature-rise period.
- prestress** — (1) to place a hardened concrete member or an assembly of units in a state of compression before application of service loads; (2) the stress developed by prestressing, such as by pretensioning or post-tensioning. (See also **prestressed concrete**, **prestressing steel**, **pretensioning**, and **post-tensioning**.)
- prestressed concrete** — structural concrete in which internal stresses have been introduced to reduce potential tensile stresses in concrete resulting from loads.
- prestressing steel** — high-strength steel elements such as wire, bar, or strands used to impart prestress forces to concrete. (See also **prestress**, **prestressed concrete**, **pretensioning**, and **post-tensioning**.)
- pretensioning** — method of prestressing in which prestressing steel is tensioned before the concrete is placed.
- pretensioning bed (or bench)** — the casting bed on which pretensioned members are manufactured and which resists the pretensioning force before release.
- primary containment system** — first containment system in contact with the hazardous material.
- primary crusher** — a heavy crusher suitable for the first stage in a process of size reduction of rock, slag, or the like.
- principal planes** — see **principal stress**.
- principal stress** — maximum and minimum stresses at any point acting at right angles to the mutually perpendicular planes of zero shearing stress, which are designated as the principal planes.
- probable flexural strength** — flexural strength based on  $1.25f_c$ .
- probabilistic design** — design based on principles of statistics (probability) for evaluation of structural safety.
- prop** — see **post** and **shore**.
- proportion** — to select proportions of ingredients to make the most economical use of available materials to produce mortar or concrete of the required properties. (See also **mixture**.)
- proportional limit** — the greatest stress that a material can sustain without any deviation from proportionality of stress to strain. (See also **Hooke's law**.)
- protected paste volume** — the portion of hardened cement paste that is protected from the effects of freezing by proximity to an entrained air void. (See also **Philleo factor** and **spacing factor**.)
- pugmill** — see **horizontal-shaft mixer**.
- pullout failure** — a failure mode in which the anchor pulls out of the concrete without development of the full steel or concrete capacity.
- pull-through failure** — a failure mode in which the anchor body pulls through the expansion mechanism without development of the full steel or concrete capacity.
- pulse velocity** — the speed at which a pulse of ultrasonic compressional stress waves travel through a material.
- pulverized-fuel ash** — see **fly ash** (preferred term).
- pumice** — a highly porous and vesicular lava usually of relatively high silica content composed largely of glass drawn into approximately parallel or loosely entwined fibers, which themselves contain sealed vesicles.
- pumicite** — naturally occurring finely divided volcanic ash composed of angular and porous particles of siliceous glass and varying proportions of crystal fragments differing from pumice only in grain size. (See also **pumice**.)

- pumpable concrete** — a property of a concrete, mortar, or grout to flow through a pipe, for a given diameter and length, that can be discharged with the desired performance—that is, homogenous, nonsegregated, and with the specified rheological properties needed for the application.
- pumping (of pavements)** — the ejection of water or water and solid materials such as clay or silt along transverse or longitudinal joints and cracks and along pavement edges caused by downward slab movement activated by the passage of loads over the pavement after the accumulation of free water on or in the base course, subgrade, or subbase.
- punching shear** — failure of a base or slab when a concentrated load punches a hole through it or where a heavily loaded suspended slab breaks away at the perimeter of a column.
- putty** — a plaster composed of quicklime or hydrated lime and water with or without plaster of paris or sand.
- pyrite** — a mineral, iron disulfide ( $\text{FeS}_2$ ), that, if it occurs in aggregate used in concrete, can cause popouts and dark brown or orange-colored staining.
- quality assurance** — actions taken by an organization to provide and document assurance that what is being done and what is being provided are in accordance with the contract documents and standards of good practice for the work.
- quality control** — actions taken by an organization to provide control and documentation over what is being done and what is being provided so that the applicable standard of good practice or the contract documents for the work are followed.
- quick setting** — see **flash setting** (preferred term).
- quicklime** — calcium oxide ( $\text{CaO}$ ).
- radar** — radio detection and ranging; a technique that employs transmission of radio waves of known frequency and time of transmission and detection of their reflections to detect and infer movement of remote objects over time.
- rail-steel reinforcement** — reinforcing bars hot-rolled from standard T-section rails.
- ramming** — a form of heavy tamping of concrete, grout, or the like by means of a blunt tool forcibly applied. (See also **dry pack** and **tamping**.)
- random ashlar** — see **ashlar masonry** (preferred term).
- raveling** — the wearing away of the concrete surface caused by the dislodging of aggregates particles.
- raw mix** — blend of raw materials ground to desired fineness, correctly proportioned, and blended ready for burning, used in the manufacture of cement clinker.
- Rayleigh wave** — a surface wave in which the particle motion is elliptical and effective penetration is less than one wavelength.
- reactive aggregate** — aggregate containing substances capable of reacting chemically with the products of solution or hydration of the portland cement in concrete or mortar under ordinary conditions of exposure, resulting in some cases in harmful expansion, cracking, or staining.
- reactive silica** — (1) several types of materials that react at high temperatures with portland cement or lime during autoclaving, includes pulverized silica, natural pozzolan, and fly ash; (2) form of silica, often amorphous or cryptocrystalline, that dissolves when in contact with concrete pore solution having sufficiently high concentration of hydroxyl ions.
- reactive stain** — reactive solution of one or more metal salts stabilized by acid that produces coloration in a concrete substrate by neutralization of acid followed by precipitation of metal hydroxides or oxides.
- ready mixed concrete** — concrete manufactured for delivery to a purchaser in a fresh state. (See also **central-mixed concrete**, **shrink-mixed concrete**, and **transit-mixed concrete**.)
- rebar** — colloquial term for reinforcing bar. (See also **reinforcement**.)
- rebound hammer** — an apparatus that provides a relative indication of the strength or hardness of concrete based on the rebound distance of a spring-driven mass after it impacts a rod in contact with the concrete surface.
- recycled concrete** — hardened concrete that has been processed for reuse, usually as aggregate.

- reference standards** — standardized mandatory language documents of a technical society, organization, or association, including the building codes of local or state authorities that are referenced in the contract documents or other standardized documents.
- refractories** — materials, usually nonmetallic, used to withstand high temperatures.
- refractoriness** — in refractories, the property of being resistant to softening or deformation at high temperatures.
- refractory** — resistant to high temperatures.
- refractory aggregate** — aggregate that is resistant to high temperatures and suitable to produce refractory concrete.
- refractory concrete** — hardened hydraulic-cement concrete that is suitable for use at temperatures between 600 and 2400°F (315 and 1315°C).
- refractory-insulating concrete** — refractory concrete having low thermal conductivity.
- regulated-set cement** — a hydraulic cement containing fluorine-substituted calcium aluminate, capable of very rapid setting.
- rehabilitation** — repairing or modifying a structure to a desired useful condition. (See also **preservation**, **repair**, and **restoration**.)
- reinforced concrete** — structural concrete reinforced with no less than the minimum amount of prestressing steel or nonprestressed reinforcement as specified in the applicable building code.
- reinforced masonry** — unit masonry in which reinforcement is embedded in such a manner that the two materials act together in resisting forces.
- reinforcement** — bars, wires, strands, fibers, or other slender elements that are embedded in a matrix such that they act together to resist forces.
- reinforcement bar** — see **reinforcement**.
- reinforcement ratio** — ratio of the area of the reinforcement to the area of the concrete at any section of a structural member. (See also **percentage of reinforcement**.)
- reinforcing bar** — see **bar** and **deformed reinforcement**.
- relative humidity** — the ratio of the quantity of water vapor actually present to the amount present in a saturated atmosphere at a given temperature expressed as a percentage.
- release agent** — material used to prevent bonding of concrete to a surface. (See also **bond breaker** and **form oil**.)
- remoldability** — the readiness with which freshly mixed concrete responds to a remolding effort such as jiggling or vibration, causing it to reshape its mass around reinforcement and to conform to the shape of the form. (See also **remolding test**.)
- remolding test** — a test to measure remoldability. (See also **remoldability**.)
- render** — to apply a coat of mortar by a trowel or float.
- repair** — reconstruction or renewal of concrete parts of an existing structure for the purpose of its maintenance or to correct deterioration, damage, or faulty construction of members or systems of a structure. (See also **preservation**, **rehabilitation**, and **restoration**.)
- repeatability** — variability among replicate test results obtained on the same material within a single laboratory by one operator.
- reproducibility** — variability among test results obtained on the same material in different laboratories.
- required average strength** — the average strength of concrete used in mixture proportioning to ensure a high likelihood that the concrete will meet specified strength acceptance criteria.
- required strength** — strength of a member or cross section required to resist factored loads or related internal moments and forces in such combinations as are stipulated in the applicable code or specification.
- resetting (of forms)** — setting of forms separately for each successive lift of a wall to avoid offsets at construction joints.
- reshore** — a temporary support placed against the bottom of a slab or other structural member immediately after the forms and original shores have been removed.
- residual deformation** — see **nonrecoverable creep**.

- residual strength** — strength in the post-peak load region of a static load-deflection curve.
- resilience** — the capability of a strained body to recover its size and shape after deformation.
- resin** — (1) general term for a class of materials made by polymerization of organic liquid compounds called monomers; (2) a plastic, viscous liquid, or monomer that is capable of hardening when mixed with appropriate catalysts or hardeners.
- resin concrete** — see **polymer concrete** (preferred term).
- resin mortar** — see **polymer concrete**.
- restoration** — the process of reestablishing the materials, form, and appearance of a structure to those of a particular era of the structure. (See also **preservation**, **rehabilitation**, and **repair**.)
- restraint (of concrete)** — restriction of free movement of fresh or hardened concrete following completion of placing in formwork or molds or within an otherwise confined space.
- retardation** — (1) reduction in the rate of either setting, hardening, or both; (2) an increase in the time required to reach time of initial and final setting or to develop early strength in a cementitious mixture. (See also **retarder**.)
- retarder** — an admixture that delays the setting of a cementitious mixture. (See also **retarding admixture**.)
- retarding admixture** — an admixture that causes a decrease in the rate of hydration of the hydraulic cement and lengthens the time of setting.
- retemper** — to add water and remix a cementitious mixture to restore workability to a condition in which the mixture is placeable or usable. (See also **temper**.)
- reveal (*n.*)** — (1) the vertical surface forming the side of an opening in a wall, as for a window or door; (2) depth of exposure of aggregate in an exposed aggregate finish. (See also **exposed-aggregate finish**.)
- revibration** — one or more applications of vibration to fresh concrete after completion of placing and initial consolidation but preceding initial setting of the concrete.
- revolving-blade (or paddle) mixer** — see **open-top mixer**.
- rheology** — science of deformation and flow of matter; evaluated using rheometers that enable one to relate variations in shear stress to shear rate.
- rib** — (1) one of a number of parallel structural members backing sheathing; (2) the portion of a T-beam that projects below the slab; (3) in deformed reinforcing bars, the deformations or the longitudinal parting ridge.
- ribbed panel** — a panel composed of a thin slab reinforced by a system of ribs in one or two directions, usually orthogonal.
- ribbed slab** — see **ribbed panel**.
- ribbon loading** — method of batching concrete in which the solid ingredients, and sometimes also the water, enter the mixer simultaneously (also called ribbon feeding).
- rich concrete** — concrete of high cement content. (See also **lean concrete**.)
- rich mixture** — a concrete mixture containing a high proportion of cement.
- rider cap** — see **pile cap** (preferred term).
- rigid frame** — a frame depending on moment in joints for stability.
- rigid pavement** — pavement that will provide high bending resistance and distribute loads to the foundation over a comparatively large area.
- rigid pier** — a pier with a small depth-to-diameter ratio such that when it is subjected to lateral loads produces insignificant flexural deformations, and lateral movements are rotational involving the entire length of the pier.
- rock pocket** — a porous, mortar-deficient portion of hardened concrete consisting of coarse aggregate and open voids. (See also **honeycomb**.)
- rod** — (1) a tool that is used as a straightedge or screed to provide a uniform and even surface across a plaster coat usually by trimming to a ground or dot; (2) a tool used as a guide for a scoring (combed) finish or similar repeating pattern finish; (3) a sharp-edged cutting screed used to trim shotcrete to forms or ground wires. (See also **screed**.)
- rodding** — consolidation of concrete by means of a tamping rod. (See also **rod** and **tamping**.)
- roller compaction** — a process for compacting concrete using a roller, often a vibratory roller.

- roller-compacted concrete** — (1) concrete compacted by roller compaction; (2) concrete that, in its unhardened state, will support a roller while being compacted.
- rotary float** — a motor-driven revolving disc that smooths, flattens, and compacts the surface of concrete floors and floor toppings (also called a power float).
- rotary kiln** — a long steel cylinder with a refractory lining supported on rollers so that it can rotate about its own axis, and erected with a slight inclination from the horizontal so that prepared raw materials fed into the higher end move to the lower end where fuel is blown in by air blast.
- rout** — to deepen and widen a crack to prepare it for patching or sealing.
- rubbed finish** — a finish obtained by using an abrasive to remove surface irregularities from concrete. (See also **sack rub**.)
- rubber setting** — see **false setting** (preferred term).
- rubbing brick** — a silicon-carbide brick used to smooth and remove irregularities from surfaces of hardened concrete.
- rubble** — (1) rough stones of irregular shape and size, broken from larger masses by geological processes or by quarrying; (2) concrete reduced to irregular fragments, as by demolition or natural catastrophe.
- rupture modulus** — see **modulus of rupture**.
- rupture strength** — see **modulus of rupture**.
- rustication** — a groove in a concrete surface.
- rustication strip** — a strip of wood or other material attached to a form surface to produce a groove or rustication in the concrete.
- R-value** — see **thermal resistance**.
- sack** — see **bag of cement** (preferred term).
- sack rub** — a finish for formed concrete surfaces, designed to produce even texture and fill pits and air holes. (See also **surface air voids** and **rubbed finish**.)
- sagging** — see **sloughing** (preferred term).
- sample** — either a group of units or portion of material taken, respectively, from a larger collection of units or a larger quantity of material that serves to provide information that can be used as a basis for action on the larger collection or quantity or on the production process.
- sampling plan** — (1) a procedure that specifies the number of units of product from a lot that is to be inspected to establish acceptability of the lot; (2) a prearranged program stipulating locations and procedures for securing samples of a material for testing purposes, for example, as concrete in construction or aggregates in a quarry, pit, or stockpile.
- sand** — (1) granular material passing the 9.5 mm (3/8 in.) sieve and almost entirely passing the 4.75 mm (No. 4) sieve and predominantly retained on the 75  $\mu$ m (No. 200) sieve, and resulting either from natural disintegration and abrasion of rock or processing of completely friable sandstone; (2) that portion of an aggregate passing the 4.75 mm (No. 4) sieve and predominantly retained on the 75  $\mu$ m (No. 200) sieve, and resulting either from natural disintegration and abrasion of rock or processing of completely friable sandstone. (See also **fine aggregate**.) Note: the definitions are alternatives to be applied under differing circumstances. Definition (1) is applied to an entire aggregate either in a natural condition or after processing. Definition (2) is applied to a portion of an aggregate. Requirements for properties and grading should be stated in the specifications. Fine aggregate produced by crushing rock, gravel, or slag commonly is known as manufactured sand.
- sand equivalent** — a measure of the relative proportions of detrimental fine dust, clay-like material, or both, in soils or fine aggregate.
- sand pocket** — a zone in concrete or mortar containing fine aggregate with little or no cement.
- sand streak** — a streak of exposed fine aggregate in the surface of formed concrete caused by bleeding.

- sandblast** — a system of cutting or abrading a surface such as concrete by a stream of sand ejected from a nozzle at high speed by compressed air, often used for cleanup of horizontal construction joints or for exposure of aggregate in architectural concrete.
- sand-coarse aggregate ratio** — ratio of fine to coarse aggregate in a batch of concrete, by mass or by volume.
- sanded grout** — grout in which fine aggregate is incorporated into the mixture.
- sand-lightweight concrete** — concrete made with a combination of expanded clay, shale, slag, or slate or sintered fly ash and natural sand, with a density generally between 105 and 120 lb/ft<sup>3</sup> (1680 and 1920 kg/m<sup>3</sup>).
- sand-lime brick** — see **calcium-silicate brick** (preferred term).
- sandstone** — a cemented or otherwise indurated sedimentary rock composed predominantly of sand grains.
- sandwich panel** — a prefabricated panel that is a layered composite formed by attaching two thin facings to a thicker core, for example, a precast-concrete panel consisting of two layers of concrete separated by a nonstructural insulating core.
- Santorin earth** — a volcanic tuff originating on the Greek island of Santorin (also called Santorini, Thira, or Thera) and used as a pozzolan.
- saponification** — the alkaline hydrolysis of fats forming a soap, more generally the hydrolysis of an ester by an alkali with the formation of an alcohol and a salt of the acid portion.
- saturated surface-dry** — condition of an aggregate particle or other porous solid when the permeable pores are filled with water and no water is on the exposed surfaces.
- saturated surface-dry bulk specific gravity** — see **saturated-surface dry specific gravity**.
- saturated surface-dry particle density** — the mass of the saturated surface-dry aggregate divided by its displacement volume in water.
- saturated-surface-dry specific gravity** — the ratio of the saturated-surface-dry mass of a volume of a material, including the volume of impermeable pores and permeable water-filled pores but not including voids between particles, at a stated temperature to the mass of an equal volume of distilled water at a stated temperature. (See also **density**.)
- saturation** — the condition such that no more liquid can be held or placed within aggregate or hardened concrete.
- saw cut** — a cut in hardened concrete made using abrasive blades or discs.
- sawdust concrete** — concrete in which the aggregate consists mainly of sawdust from wood.
- sawed joint** — a joint cut in hardened concrete, generally not to the full depth of the member, by means of special equipment.
- scaffold** — temporary structure for the support of deck forms, cartways, or workers, or a combination of these, such as an elevated platform for supporting workers, tools, and materials.
- scaling** — local flaking or peeling away of the near-surface portion of hardened concrete or mortar.
- scalping screen** — a sieve for removing oversize particles.
- scanning electron microscope** — an electron microscope in which the image is formed by a beam operating in synchronism with an electron probe scanning the object; the intensity of the image-forming beam is proportional to the scattering or secondary emission of electrons by the specimen where the probe beam strikes it.
- scarf connection** — a connection made by precasting, beveling, halving, or notching two pieces to fit together; after overlapping, the pieces are secured by bolts or other means.
- scatterer** — physical object from which radar or acoustic energy is reflected or refracted, typically at boundaries between media having different dielectric properties or acoustic impedance, respectively.
- Schmidt hammer** — see **rebound hammer**.

- scoria** — vesicular volcanic ejecta of larger size, usually of basic composition and characterized by dark color; the material is relatively heavy and partly glassy, partly crystalline; the vesicles do not generally interconnect. (See also **lightweight aggregate**.)
- scour** — (1) erosion of soil around concrete members by water; (2) erosion of a concrete surface, exposing the aggregate.
- scratch coat** — the first coat of plaster or stucco applied to a surface in three-coat work, usually cross-raked or scratched to form a mechanical key with the brown coat.
- screed** — (1) to strike off a cementitious mixture lying beyond the desired plane or shape; (2) a tool for striking off the cementitious mixture surface, sometimes referred to as a strikeoff; (3) a ribbon or pad of a cementitious mixture that is preplaced to act as a guide for maintaining the desired level as more material is placed.
- screed guide** — firmly established grade strips or side forms for unformed concrete that guide the strikeoff in producing the desired plane or shape.
- screed rails** — see **screed guide**.
- screed wire** — see **ground wire**.
- screeding** — the operation of forming a surface using a screed. (See also **strikeoff**.)
- screen** — production equipment for separating granular material according to size using woven-wire cloth or other similar device with regularly spaced openings of uniform size.
- sealant** — see **joint sealant**.
- sealer** — a liquid that is applied to the surface of hardened concrete, is colorless, is absorbed by the concrete, leaves little or nothing visible on the surface, and either prevents or decreased the penetration of liquid or gaseous media. (See also coating and **curing compound**.)
- sealing compound** — see **sealer**.
- seating** — see **anchorage deformation**.
- secondary containment system** — backup hazardous material containment system in the event the primary containment system leaks or fails.
- secondary crusher** — a crusher used for the second stage in a process of size reduction of aggregate and the like. (See also **primary crusher**.)
- segmental construction** — method of construction whereby individual elements are prestressed together by post-tensioning so that the elements act as a monolithic unit in resisting applied loads.
- segregation** — (1) nonuniform concentration of components in concrete or mortar; (2) nonuniform distribution of size fractions in a mass of aggregate; (3) the gravitational settlement of solids from a liquid (also called separation). (See also **bleeding**.)
- self-consolidating concrete** — highly flowable, non-segregating concrete that can spread into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation.
- self-desiccation** — the consumption of free water by chemical reaction so as to leave insufficient water to cover the solid surfaces and cause a decrease in the relative humidity of the system.
- self-furring** — metal lath or welded-wire reinforcement formed in the manufacturing process to include means by which the material is held away from the supporting surface, thus creating a space for keying of the insulating concrete, plaster, or stucco.
- self-stressing concrete (mortar or grout)** — expansive-cement concrete (mortar or grout) in which expansion, if restrained, induces compressive stresses in the concrete (mortar or grout).
- selvage** — a finished edge of woven-wire screen cloth produced in the weaving process of the finer meshes.
- semiautomatic batcher** — see **batcher**.
- sensor** — a device designed to respond to a physical stimulus (as temperature, illumination, and motion) and transmit a resulting signal for interpretation, measurement, or for operating a control.

- separation** — see **segregation**.
- service dead load** — unfactored dead loads.
- service live load** — unfactored live loads.
- service load** — all loads, static or dynamic, imposed on a structure, or element thereof, during operation of a facility.
- set (*n.*)** — the condition reached by a cement paste, mortar, or concrete when it has lost plasticity to an arbitrary degree, usually measured in terms of resistance to penetration or deformation; “initial set” refers to first stiffening; “final set” refers to attainment of significant rigidity; also, strain remaining after removal of stress.
- set time** — the lapsed time from the addition of mixing water to a cementitious mixture until the mixture reaches a specified degree of rigidity as measured by a specific procedure.
- set-accelerating admixture** — see **accelerator**.
- set-retarding admixture** — see **retarding admixture** and **retarder**.
- setting** — a chemical process that results in a gradual development of rigidity of a cementitious mixture, adhesive, or resin.
- setting time** — (1) time to achieve either initial setting or final setting (see also **initial setting** and **final setting**); (2) the length of time required to set or harden resin or adhesive under heat or pressure.
- settlement** — sinking of solid particles in a fresh cementitious mixture after placement and before initial setting. (See also **bleeding**.)
- settling** — the lowering in elevation of sections of pavement or structures due to their mass, the loads imposed on them, or shrinkage or displacement of the support.
- severe exposure condition** — an environment, normally in cold climate regions, in which concrete may be saturated or in almost continuous contact with moisture before freezing, and where deicing agents are used.
- shale** — a laminated and fissile sedimentary rock, the constituent particles of which are principally in clay and silt sizes (the laminations are bedding planes of the rock).
- sharp sand** — coarse sand consisting of particles of angular shape.
- she bolt** — a type of form bolt that has female threads at one end of the bolt, allowing for a threaded insert to be attached.
- shear** — an internal force tangential to the plane on which it acts.
- shear cap** — thickened portion of the slab around the column with plan dimensions not conforming with the **ACI 318** requirements for drop panels.
- shear reinforcement** — reinforcement designed to resist shear or diagonal tension stresses. (See also **dowel**.)
- shear strength** — the maximum shearing stress that a flexural member can support at a specific location as controlled by the combined effects of shear forces and bending moment.
- shear stress** — the stress component acting tangentially to a plane.
- shearhead** — assembled unit in the top of the columns of flat slab or flat plate construction to transmit loads from slab to column.
- shearwall** — a wall portion of a structural frame intended to resist lateral forces, such as earthquake, wind, and blast, acting in the plane of the wall.
- sheath** — an enclosure in which post-tensioning tendons are encased to prevent bonding during concrete placement. (See also **duct**.)
- sheathing** — (1) material encasing prestressing steel to prevent bonding of the prestressing steel with the surrounding concrete to provide corrosion protection and to contain the corrosion-inhibiting coating (also called a sheath); (2) the material forming the contact face of forms (also called lagging or sheeting).
- sheet pile** — a pile in the form of a plank driven in close contact or interlocking with others to provide a tight wall to resist the lateral pressure of water, adjacent earth, or other materials.
- sheeting** — see **sheathing** (preferred term).

- shelf angles** — structural angles with holes or slots in one leg for bolting to the structure to support brick work, stone, or terra cotta.
- shielding concrete** — concrete employed as a biological shield to attenuate or absorb nuclear radiation, usually characterized by high density or high hydrogen (water) or boron content, having specific radiation attenuation effects. (See also **biological shielding**.)
- shim** — a strip of metal, wood, or other material employed to set base plates or structural members at the proper level for placement of grout, or to maintain the elongation in some types of post-tensioning anchorages.
- shooting** — placing of shotcrete. (See also **gunning**.)
- shore** — vertical or inclined support member or braced frame designed to carry the weight of the formwork, concrete, and construction loads above.
- shoring** — (1) props or posts of timber or other material in compression used for the temporary support of excavations, formwork, or unsafe structures; (2) the process of erecting shores.
- shoring layout** — a drawing prepared before erection showing arrangements of equipment for shoring.
- short column** — (1) a column whose load capacity is limited by strength rather than buckling; (2) a column so stocky and sufficiently restrained that at least 95% of the cross-sectional strength can be developed.
- shorten** — to decrease in length. (See also **elongation** and **shrinkage**.)
- shotcrete** — concrete placed by a high-velocity pneumatic projection from a nozzle.
- shotcreter** — craftsman on shotcrete crew who manipulates the nozzle, controls consistency with the dry process, and controls final deposition of the material.
- shotcrete rebound** — shotcrete materials or wet shotcrete that bounce away from the surface against which the shotcrete is being projected.
- shoulder** — an unintentional offset in a formed concrete surface usually caused by bulging or movement of formwork.
- shrinkage** — decrease in either length or volume of a material resulting from changes in moisture content or chemical changes.
- shrinkage crack** — crack due to restraint of shrinkage.
- shrinkage cracking** — cracking of a structure or member due to failure in tension caused by external or internal restraints as moisture content is reduced, carbonation occurs, or both.
- shrinkage loss** — reduction of stress in prestressing steel resulting from shrinkage of concrete.
- shrinkage reinforcement** — reinforcement designed to resist shrinkage stresses in concrete.
- shrinkage-compensating** — a characteristic of grout, mortar, or concrete made using expansive cement in which volume increases after setting and, if properly elastically restrained, induces compressive stresses that are intended to approximately offset the tendency of drying shrinkage to induce tensile stresses.
- shrinkage-compensating cement** — see **expansive cement**.
- shrinkage-compensating concrete** — concrete containing expansive components usually based on formation of calcium sulfoaluminate (ettringite) in a mixture of calcium aluminate and gypsum. (See also **expansive cement**.)
- shrink-mixed concrete** — ready mixed concrete mixed partially in a stationary mixer and then mixed in a truck mixer.
- SI (Système International)** — the modern metric system.
- side-face blowout failure** — concrete spalling on the side face around the embedded head with no major breakout at the top concrete surface.
- sieve** — a metallic plate or sheet, woven-wire cloth, or other similar device with regularly spaced apertures of uniform size mounted in a suitable frame or holder for use in separating granular material according to size.
- sieve analysis** — the process of determining particle-size distribution of an aggregate. (See also **grading**.)
- sieve fraction** — that portion of a sample that passes through a standard sieve of specified size and is retained by some finer sieve of specified size.

- sieve number** — a number used to designate the size of a sieve. (See also **sieve size** [preferred term].)
- sieve size** — nominal size of openings between crosswires of a testing sieve.
- significant** — values of a test statistic that lie outside of predetermined limits of test precision and so taken to indicate a difference between populations (also called statistically significant).
- silica** — silicon dioxide (SiO<sub>2</sub>).
- silica flour** — very finely divided silica, a siliceous binder component that reacts with lime under autoclave curing conditions, prepared by grinding silica, such as quartz, to a fine powder (also called silica powder).
- silica fume** — very fine noncrystalline silica produced in electric arc furnaces as a by-product of the production of elemental silicon or alloys containing silicon.
- silica powder** — see **silica flour** (preferred term).
- silicate** — salt of a silicic acid. (See also **alite**, **belite**, **blast-furnace slag**, **bedigitite**, **calcium-silicate brick**, **calcium-silicate hydrate**, **celite**, **clay**, **dicalcium silicate**, **fire clay**, **hydraulic hydrated lime**, **kaolinite**, **mellilite**, **siliceous-aggregate concrete**, **smectite**, **Stratling's compound**, **tricalcium silicate**, **vermiculite**, and **xonotlite**).
- siliceous-aggregate concrete** — concrete made with normal-density aggregates having constituents composed mainly of silica or silicates.
- silicone** — a resin characterized by water-repellent properties in which the main polymer chain consists of alternating silicon and oxygen atoms with carbon-containing side groups.
- silt** — a granular material resulting from the disintegration of rock with grains largely passing a 75 μm (No. 200) sieve; particles in the range from 2 to 50 μm diameter.
- simple beam** — a beam without rotational restraint or continuity at its supports (also called a simply supported beam).
- single-sized aggregate** — aggregate in which a major portion of the particles is in a narrow size range.
- sinter** — (1) a ceramic material or mixture fired to less than complete fusion, resulting in a coherent mass; (2) the process of creating a ceramic material or mixture fired to less than complete fusion, resulting in a coherent mass.
- sintering** — the formation of a porous mass of material by the agglomeration of fine particles during particle fusion.
- skid resistance** — a measure of the frictional characteristics of a surface.
- slab** — a molded layer of plain or reinforced concrete, flat, horizontal (or nearly so), usually of uniform but sometimes of variable thickness, and supported by beams, columns, walls, other framework, or on the ground. (See also **flat slab** and **flat plate**.)
- slab bolster** — continuous wire bar support used to support bars in the bottom of slabs where the top wire is corrugated at 1 in. (25 mm) centers to hold bars in position. (See also **bar support**.)
- slab strip** — see **middle strip** (preferred term).
- slab-jacking** — the process of either raising concrete pavement slabs or filling voids under them, or both, by injecting a material (cementitious, noncementitious, or asphaltic) under pressure.
- slab-on-ground** — a slab cast directly on the ground (also called slab-on-grade).
- slag** — see **blast-furnace slag**.
- slag cement** — granulated blast-furnace slag that has been finely ground and that is hydraulic cement.
- slag-activity index** — the ratio of the compressive strength of a mortar cube made with equal amounts of slag and portland cement to the compressive strength of a mortar cube made with the same portland cement.
- slake time** — time between initial mixing and ingredients reacting sufficiently to provide a stable mixture for testing and use.
- slate** — a fine-grained metamorphic rock possessing a well-developed fissility (slaty cleavage), usually not parallel to the bedding planes of the rock.

- sleeve** — (1) a pipe or tube passing through formwork for a wall or slab through which pipe, wires, or conduit can be passed after the forms have been stripped; (2) a device used around an anchor to accommodate adjustment and preloading of the anchor after the concrete has hardened.
- slender beam** — a beam that, if loaded to failure without lateral bracing of the compression flange, would fail by buckling rather than in flexure.
- slender column** — a column whose load capacity is reduced by the increased eccentricity caused by secondary deflection moments.
- slenderness ratio** — the effective unsupported length of a uniform column divided by the least radius of gyration of the cross-sectional area.
- slick line** — end section of a pipeline used in placing concrete by pump that is immersed in the placed concrete and moved as the work progresses.
- sliding form** — see **slipform** (preferred term).
- slip** — movement occurring between steel reinforcement and concrete in stressed reinforced concrete, indicating anchorage breakdown.
- slipform** — a form that is pulled or raised as concrete is placed
- sloped footing** — a footing having sloping top or side faces.
- sloughing** — subsidence of shotcrete, plaster, or the like, generally due to excessive water in the mixture (also called sagging).
- slugging** — pulsating and intermittent flow of shotcrete material due to improper use of delivery equipment and materials.
- slump** — a measure of consistency of freshly mixed concrete, mortar, or stucco equal to the subsidence measured to the nearest 1/4 in. (5 mm) of the molded specimen immediately after removal of the slump cone.
- slump cone** — a mold in the form of the lateral surface of the frustum of a cone with a base diameter of 8 in. (203 mm), top diameter 4 in. (102 mm), and height 12 in. (305 mm), used to fabricate a specimen of freshly mixed concrete for the slump test.
- slump flow** — measure of unconfined flow potential of a freshly mixed self-consolidating concrete; value is equal to the average of two perpendicular diameters of the material measured to the nearest 1/2 in. (10 mm) after it is released from the slump cone and stops flowing.
- slump loss** — the amount by which the slump of freshly mixed concrete changes during a period of time after an initial slump test was made on a sample or samples thereof.
- slurry** — a mixture of water and any finely divided insoluble material, such as portland cement, slag, or clay in suspension.
- smectite** — a group of clay minerals, including montmorillonite, characterized by a sheet-like internal atomic structure, consisting of extremely finely-divided hydrous aluminum or magnesium silicates that swell on wetting, shrink on drying, and are subject to ion exchange.
- snap tie** — a proprietary concrete wall-form tie, the end of which can be twisted or snapped off after the forms have been removed.
- snow load** — the force considered in the design of a flat or pitched surface, usually a roof, for the possible amount of snow, ice, or both, lying on it.
- soffit** — the underside of a part or member of a structure, such as a beam, stairway, or arch.
- soil** — a generic term for unconsolidated natural surface material above bedrock.
- soil cement** — a mixture of soil and measured amounts of portland cement and water compacted to a high density.
- soil pressure** — see **contact pressure**.
- soil stabilization** — chemical or mechanical treatment designed to either increase or maintain the stability of a mass of soil or otherwise to improve its engineering properties.
- solid masonry unit** — a unit whose net cross-sectional area in every plane parallel to the bearing surface is 75% or more of its gross cross-sectional area measured in the same plane.
- solid masonry wall** — a wall built of blocks or solid masonry units, the mortar completely filling the joints between units.

- solid panel** — a solid slab, usually of constant thickness.
- solid volume** — see **absolute volume**.
- solid-unit masonry** — masonry consisting wholly of solid masonry units laid in mortar.
- solubility** — the amount of one material that will dissolve in another, generally expressed as mass percent, as volume percent, or parts per 100 parts of solvent by mass or volume at a specified temperature.
- solution** — a liquid consisting of at least two substances, one of which is a liquid solvent in which the other or others, that may be either solid or liquid, are dissolved.
- soundness** — the freedom of a solid from cracks, flaws, fissures, or variations from an accepted standard; in the case of a cement, freedom from excessive volume change after setting; in the case of aggregate, the ability to withstand the aggressive action to which concrete containing it might be exposed, particularly that due to weather.
- spacer** — device that maintains reinforcement in proper position, also a device for keeping wall forms apart at a given distance before and during concreting. (See also **spreader**.)
- spacing factor** — an index related to the maximum distance of any point in a cement paste or in the cement paste fraction of mortar or concrete from the periphery of an air void (also called Powers' spacing factor). (See also **Philleo factor**.)
- spading** — consolidation of mortar or concrete by repeated insertion and withdrawal of a flat, spade-like tool.
- spall** — a fragment, usually in the shape of a flake, detached from a larger mass by a blow, the action of weather, pressure, or expansion within the larger mass.
- spalling** — the development of spalls.
- span** — distance between the support reactions of members carrying transverse loads.
- span length** — see **effective span**.
- span-depth ratio** — the numerical ratio of total span to member depth.
- spandrel** — that part of a wall between the head of a window and the sill of the window above it.
- spandrel beam** — a beam in the perimeter of a building, spanning between columns and usually supporting a floor or roof.
- spatterdash** — a rich mixture of portland cement and coarse sand thrown onto a background by a trowel, scoop, or other appliance to form a thin, coarse-textured, continuous coating; as a preliminary treatment before rendering, it assists bond of the undercoat to the background, improves resistance to rain penetration, and evens out the suction of variable backgrounds. (See also **dash-bond coat** and **parge**.)
- specialty structural engineer** — licensed design professional retained by a contractor or specialty subcontractor to design a delegated portion of the project.
- specific gravity factor** — the ratio of the mass of aggregates (including moisture), as introduced into the mixer, to the effective volume displaced by the aggregates.
- specific heat** — the amount of heat required per unit mass to cause a unit rise of temperature over a small range of temperature.
- specific surface** — the surface area of particles or of air voids contained in a unit mass or unit volume of a material.
- specification (in ASTM)** — an explicit set of requirements to be satisfied by a material, product, system, or service.
- specified compressive strength** — compressive strength of concrete used in design.
- specified concrete compressive strength** — the specified resistance of a concrete specimen to axial compressive loading used in design calculations and as the basis for acceptance of concrete used in the work.
- specified concrete equivalent strength** — in-place concrete compressive strength adjusted by correction factors that can be directly substituted into conventional strength equations with customary strength reduction factors.
- specifier** — person or entity preparing specifications for a material, product, system, or service. (See also **specification**.)
- specimen** — a piece or portion of a sample used to make a test.

- spill** — any uncontrolled release of hazardous material from the primary into the secondary containment system.
- spinning** — the essential factor of the process of producing spun concrete. (See also **spun concrete**.)
- spiral reinforcement** — continuously wound reinforcement in the form of a cylindrical helix.
- spirally reinforced column** — a column in which the vertical bars are enveloped by spiral reinforcement. (See also **spiral reinforcement**.)
- splice** — (1) connection of one reinforcing bar to another by lapping, welding, mechanical couplers, or other means; (2) connection of welded-wire reinforcement by lapping; (3) connection of piles by mechanical couplers.
- split-face block** — a concrete masonry unit with one or more faces purposely fractured to provide architectural effects in masonry wall construction.
- splitting tensile strength** — tensile strength of concrete determined by a splitting tensile test (also called indirect tension strength).
- splitting tensile test** — a test for tensile strength in which a cylindrical specimen is loaded to failure in diametral compression applied along the entire length (also called indirect tension test).
- spray drying** — a method of evaporating the liquid from a solution or dispersion by spraying it into a heated gas.
- sprayed concrete** — European terminology for shotcrete (concrete placed by a high-velocity pneumatic projection from a nozzle).
- sprayed mortar** — low-velocity sprayed mortar; a low-velocity, low-pressure spall repair spray using prepackaged mortar.
- spread footing** — a generally rectangular prism of concrete, larger in lateral dimensions than the column or wall it supports, to distribute the load of a column or wall to the subgrade.
- spreader** — (1) a piece of lumber approximately 1 by 2 in. (25 by 50 mm) cut to the thickness of a wall or other formed element and inserted in the form to hold it temporarily at the correct dimension against tension of form ties; (2) a device consisting of reciprocating paddles, a revolving screw, or other mechanism for distributing concrete to required uniform thickness in a paving slab.
- spud vibrator** — a vibrator with a vibrating casing or a vibrating head used to consolidate freshly placed concrete by insertion into the mass.
- spun concrete** — see **centrifugally cast concrete** (preferred term).
- stability** — ability of a material to maintain the homogeneous distribution of its various constituents during its flow and setting.
- stacking tube** — a slender, free-standing tubular structure used to store granular materials; the material is loaded into the top of the tube and spills out of wall openings to make a conical pile surrounding the tube.
- stain (v.)** — use of a chemical stain or a concrete dye to change the color of the concrete surface that can be a penetrant or a low-build coating that does not appreciably change the concrete's texture.
- tamping** — process of applying a surface pattern to decorative concrete by using impact pressure to emboss texture, patterns, or faux joints into the surface of plastic concrete.
- standard curing** — exposure of test specimens to specified conditions of moisture and temperature.
- standard fire test** — the test prescribed by [ASTM E119](#).
- standard hook** — a hook at the end of a reinforcing bar made in accordance with a standard.
- standard hooked bar** — a reinforcing bar with the end bent into a hook of prescribed geometry to provide anchorage.
- standard sand** — silica sand, composed almost entirely of naturally rounded grains of nearly pure quartz, used for preparing mortars in the testing of hydraulic cements.
- standard time-temperature curve** — the graphic timetable for application of temperature to a material or member for the [ASTM E119](#) fire test.

- static load** — (1) the mass of a single stationary body or the combined masses of stationary bodies in a structure (such as the load of a stationary vehicle on a roadway); (2) during construction, the combined mass of forms, stringers, joists, reinforcing bars, and the actual concrete to be placed. (See also **dead load**.)
- static modulus of elasticity** — the value of Young's modulus of elasticity obtained by arbitrary criteria from measured stress-strain relationships derived from other than dynamic loading.
- stationary hopper** — a container used to receive and temporarily store freshly mixed concrete.
- steam curing** — (1) curing of concrete, mortar, grout, or neat-cement paste in water vapor at atmospheric or higher pressures and at temperatures between approximately 100 and 420°F (40 and 215°C). (See also **atmospheric-pressure steam curing**, and **autoclave curing**.)
- stearic acid** — a white crystalline fatty acid, obtained by saponifying tallow or other hard fats containing stearin. (See also **butyl stearate**.)
- steel sheet** — cold-formed sheet or strip steel shaped as a structural member for the purpose of carrying the live and dead loads in lightweight concrete roof construction.
- steel trowel** — see **trowel**.
- stencil patterned concrete** — texture created by use of preprinted pattern stencils or freeform using alternate texturing materials.
- stepped footing** — a step-like support consisting of prisms of concrete of progressively diminishing lateral dimensions superimposed on each other to distribute the load of a column or wall to the subgrade.
- sticky cement** — finished cement that develops low or zero flowability during or after storage in silos or after transportation in bulk containers or hopper-bottom cars; may be caused by interlocking of particles, mechanical compaction, or electrostatic attraction between particles. (See also **warehouse setting**.)
- stiffback** — see **strongback** (preferred term).
- stiffness** — resistance to deformation.
- stirrup** — bar or wire reinforcement oriented normal to or at an acute angle to the longitudinal reinforcement in a flexural member and extending as close as practical to the extreme tension and compression fibers of the cross section. (See also **transverse reinforcement** and **tie**.)
- stoichiometric** — (1) characterized by or being a proportion of substances or energy in a specific chemical reaction in which there is no excess of any reactant or product; (2) proportioning based on atomic or molecular weight.
- stone sand** — fine aggregate resulting from the mechanical crushing and processing of rock. (See also **fine aggregate** and **sand**.)
- storage hopper** — see **stationary hopper**.
- straightedge** — (1) a rigid, straight piece of either wood or metal used to strikeoff or screed a concrete surface to proper grade or to check the planeness of a finished grade (see also **rod**, **screed**, and **strikeoff**); (2) a highway tool for truing surfaces instead of a bull float.
- straight-line theory** — an assumption in reinforced-concrete analysis according to which the strains in a member under flexure are assumed to vary in linear proportion to the distance from the neutral axis.
- strain** — the change in length per unit of length, in a linear dimension of a body.
- strain hardening** — ability to carry increasing tensile load beyond the point of first crack.
- strain softening** — ability to carry a reduced (but non-zero) tensile load beyond the point of first cracking.
- strand** — (1) a prestressing tendon composed of numerous wires twisted around the center wire or core; (2) ordered assemblage of filaments of predetermined quantity based on the number of filaments per strand that have a high ratio of length to diameter, are normally used as a unit, and are bundled together to resist splitting or filamentation.
- strand wrapping** — application of high tensile strand, wound under tension by machines around circular concrete or shotcrete walls, domes, or other tension-resisting structural components.

- stratification** — (1) the separation of overwet or overvibrated concrete into horizontal layers with increasingly lighter material toward the top; water, laitance, mortar, and coarse aggregate tend to occupy successively lower positions in that order; (2) a layered structure in concrete resulting from placing of successive batches that differ in appearance; (3) occurrence in aggregate stockpiles of layers of differing grading or composition; (4) a layered structure in a rock foundation.
- Stratling's compound** — dicalcium aluminate monosilicate-8-hydrate, a compound that has been found in reacted lime-pozzolan and cement-pozzolan mixtures.
- strength** — a generic term for the ability of a material to resist strain or rupture induced by external forces. (See also **concrete compressive strength**, **fatigue strength**, **flexural strength**, **shear strength**, **splitting tensile strength**, **tensile strength**, **ultimate strength**, and yield strength.)
- strength-design method** — a design method that requires service loads to be multiplied by load factors and computed nominal strengths to be multiplied by strength reduction factors.
- stress** — force per unit area.
- stress concentration** — localized increase in internal stress caused by a defect or discontinuity.
- stress corrosion** — corrosion of a metal either initiated or accelerated by stress.
- stress relaxation** — the time-dependent decrease in stress in a material held at constant strain. (See also **creep**.)
- stressing end** — in prestressed concrete, the end of the tendon at which the load is applied when tendons are stressed from one end only.
- stress-strain diagram** — a diagram in which corresponding values of stress and strain are plotted against each other.
- stretcher** — a masonry unit laid with its length horizontal and parallel with the face of a wall or other masonry member. (See also **header**.)
- strikeoff** — to remove concrete in excess of that which is required to fill the form evenly or bring the surface to grade; performed with a straightedged piece of wood or metal by means of a forward sawing movement or by a power-operated tool appropriate for this purpose (this is also the name applied to the tool). (See also **scree** and **screeing**.)
- stringer** — a secondary flexural member that is parallel to the longitudinal axis of a bridge or other structure. (See also **beam**.)
- strip** — (1) to remove formwork or a mold; (2) a long thin piece of wood, metal, or other material. (See also **demold** and **stripping**.)
- strip foundation** — a continuous foundation wherein the length considerably exceeds the breadth.
- stripper** — a liquid compound formulated to remove coatings by either chemical action, solvent action, or both.
- stripping** — the removal of formwork or a mold. (See also **demold**.)
- strongback** — a frame attached to the back of a form or precast structural member to stiffen or reinforce the form or member during concrete placing operations or handling operations.
- structural adhesive** — a bonding agent used for transferring required loads between adherents exposed to service environments typical for the structure involved.
- structural concrete** — plain or reinforced concrete in a member that is part of a structural system required to transfer gravity loads, lateral loads, or both, along a load path to the ground.
- structural end-point** — the acceptance criterion of **ASTM E119**, which states that the specimen shall sustain the applied load without collapse.
- structural health monitoring** — methodology entailing the use of instruments and sensors to identify changes of structural and material responses, environmental conditions, and loads.
- structural lightweight concrete** — structural concrete made with lightweight aggregate and having an air-dry density of not more than 115 lb/ft<sup>3</sup> (1850 kg/m<sup>3</sup>).
- structural load test** — procedure consisting of applying loads to verify the load-carrying capacity of a structure or structural member.

- structural repair** — a repair that reestablishes or enhances the structural capacity of a member.
- structural sandwich construction** — a laminar construction comprising a combination of alternating dissimilar simple or composite materials assembled and intimately fixed in relation to each other so as to use the properties of each to attain specific structural and thermal advantages for the entire assembly.
- structural slab-on-ground** — a slab having a designed thickness and reinforcement that allows for loads to be transferred along a path to foundation soils, structural elements, or both.
- strut** — see **shore**.
- strut-and-tie model** — a framework or truss model of a structural member or of a D-region in such a member made up of struts and ties connected at nodes, capable of transferring the factored loads to the supports or to adjacent B-regions.
- stub wall** — low wall, usually 4 to 8 in. (100 to 200 mm) high, placed monolithically with a concrete floor or other members to provide for control and attachment of wall forms (also called kicker in the United Kingdom).
- stucco** — a portland cement-based plaster used for coating exterior walls and other exterior surfaces. (See also **plaster**.)
- stud** — (1) member of appropriate size and spacing to support sheathing of concrete forms; (2) a headed steel device used to anchor steel plates or shapes to concrete members.
- subaqueous concrete** — see **underwater concrete**.
- subbase** — the layer in a pavement system between the subgrade and the base course, or between the subgrade and the pavement.
- subgrade** — the soil prepared and compacted to support a structure or a pavement system.
- subgrade modulus** — see **coefficient of subgrade reaction**.
- subgrade reaction** — see **contact pressure** and **coefficient of subgrade reaction**.
- substrate** — any material on the surface of which another material is applied.
- substructure** — all of that part of a structure below grade.
- sulfate attack** — a chemical reaction, physical reaction, or both, between sulfates usually in soil or groundwater and concrete or mortar.
- sulfate resistance** — ability of concrete or mortar to withstand sulfate attack. (See also **sulfate attack**.)
- sulfate-resistant cement** — portland cement that is low in tricalcium aluminate, to reduce susceptibility of concrete to attack by dissolved sulfates in water or soils, referred to as **ASTM C150/C150M Type V** cement.
- sulfoaluminate cement** — see **Type K expansive cement**.
- sump** — any structural reservoir, usually below grade, designed for collection of runoff or accidental spillage of hazardous material. It often includes troughs, trenches, and piping connected to the sump to help collect and transport runoff liquids. Regulations may not distinguish between a sump and an underground tank.
- superimposed load** — the load, other than its own weight, that is resisted by a structural member or system.
- superplasticizer** — see **high-range water-reducing admixture** (preferred term).
- superstructure** — all of that part of a structure above grade.
- supersulfated cement** — a hydraulic cement made by intimately intergrinding a mixture of granulated blast-furnace slag; calcium sulfate; and a small amount of lime, portland cement, or portland cement clinker; so named because the equivalent content of sulfate exceeds that for portland blast-furnace slag cement.
- supplementary cementitious material** — inorganic material such as fly ash, silica fume, metakaolin, or slag cement that reacts pozzolanically or hydraulically.
- surface active** — having the ability to modify surface energy and to facilitate wetting, penetrating, emulsifying, dispersing, solubilizing, foaming, frothing, and other substances.
- surface air voids** — small regular or irregular cavities, usually not exceeding 5/8 in. (15 mm) in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation. (See also **sack rub**.)

- surface area** — see **specific surface**.
- surface bonding (of masonry)** — bonding of dry-laid masonry by parging with a thin layer of fiber-reinforced mortar.
- surface moisture** — free water retained on surfaces of aggregate particles and considered to be part of the mixing water in concrete, as distinguished from absorbed moisture.
- surface retarder** — a retarder applied to the contact surface of a form or to the surface of newly placed concrete to delay setting of the cement, facilitate construction joint cleanup, or facilitate production of exposed-aggregate finish.
- surface tension** — an internal molecular force that exists in the surface film of all liquids and affects the wetting characteristics of the liquid.
- surface texture** — degree of roughness or irregularity of the exterior surfaces of aggregate particles as well as of hardened concrete.
- surface vibrator** — a vibrator used for consolidating concrete by application to the surface of a mass of freshly mixed concrete; four principal types exist: vibrating screeds, pan vibrators, plate or grid vibratory tampers, and vibratory roller screeds.
- surface voids** — cavities visible on the surface of a solid. (See also **surface air voids**.)
- surface water** — see **surface moisture** (preferred term).
- surface-active agent** — a substance that affects markedly the interfacial or surface tension of solutions when present, even in low concentrations.
- surfactant** — a shortened form of the term surface-active agent.
- sustained modulus of elasticity** — term including elastic and inelastic effects in one expression to aid in visualizing net effects of stress-strain up to any given time, computed by dividing the unit sustained stress by the sum of the elastic and inelastic deformations at that time.
- sway brace** — a diagonal brace used to resist wind or other lateral forces. (See also **bracing**, **cross bracing**, and **X-brace**.)
- swelling** — increase in either length or volume. (See also **expansion**, **volume change**, and **autogenous volume change**.)
- swirl finish** — a non-skid texture imparted to a concrete surface during final troweling by keeping the trowel flat and using a rotary motion.
- Swiss hammer** — see **rebound hammer** (preferred term).
- syngenite** — potassium calcium sulfate hydrate, a compound sometimes produced during hydration of portland cement, found in deteriorating portland-cement concrete and said to form in portland cement during storage by reaction of potassium sulfate and gypsum.
- system failure** — any uncontrolled release of hazardous material from the tank system into the environment.
- Système International** — see **SI**.
- talc** — a mineral with a greasy or soapy feel, very soft, having the composition  $Mg_3Si_4O_{10}(OH)_2$ . (See also **masonry cement** and **Mohs scale**).
- tamp process** — a process for producing concrete products, such as pipe, that uses direct mechanical action to consolidate the concrete by the action of tampers that rise automatically as the form is rotated and filled with concrete from above. (See also **centrifugal process**, **dry-cast process**, **packerhead process**, and **wet-cast process**.)
- tamper** — (1) an implement used to consolidate concrete or mortar in molds or forms; (2) a hand-operated device for consolidating floor topping or other unformed concrete by impact from the dropped device in preparation for strikeoff and finishing; contact surface often consists of a screen or a grid of bars to force coarse aggregates below the surface to prevent interference with floating or troweling. (See also **jitterbug**.)
- tamping** — the operation of consolidating freshly placed concrete by repeated blows or penetrations with a tamper. (See also **consolidation** and **rodding**.)
- tamping rod** — a straight steel rod of circular cross section and having one or both ends rounded to a hemispherical tip.

- tank** — stationary containment structure with self-supporting, watertight walls constructed of non-earthen material.
- tank system** — composed of its primary and secondary containment systems, and any leak-detection system or ancillary equipment.
- T-beam** — a beam composed of a stem and a flange in the form of a T.
- telltale** — any device designed to indicate movement of formwork or of a point on the longitudinal surface of a pile under load.
- temper** — to add water to a cementitious mixture as necessary to initially bring the mixture to the desired workability. (See also **retemper**.)
- temperature cracking** — cracking due to tensile failure caused by temperature drop in members subjected to external restraints or by temperature differential in members subjected to internal restraints (also called thermal cracking).
- temperature reinforcement** — reinforcement designed to carry stresses resulting from temperature changes; also, the minimum reinforcement for areas of members that are not subjected to primary stresses or necessarily to temperature stresses.
- temperature rise** — the increase of temperature caused by either absorption of heat or internal generation of heat, for example, hydration of cement in concrete.
- temperature stress** — stress in a restrained structure or a member due to changes or differentials in temperature in the structure or member.
- temperature-rise period** — the time interval during which the temperature of a concrete product rises at a controlled rate to the desired maximum in autoclave or atmospheric-pressure steam curing.
- temperature-time factor** — product of temperature multiplied by time for a specific interval. (See also **maturity factor**.)
- template** — (1) a thin plate or board frame used as a guide in positioning or spacing form parts, reinforcement, or anchors; (2) a full-size mold, pattern, or frame, shaped to serve as a guide in forming or testing contour or shape.
- temporary stress** — a stress that may be produced in a precast-concrete member or in a component of a precast-concrete member during fabrication or erection, or in cast-in-place concrete structures due to construction or test loadings.
- tendon** — an assembly consisting of a tensioned element (such as a wire, bar, rod, strand, or a bundle of these elements) used to impart compressive stress in concrete, along with any associated components used to enclose and anchor the tensioned element.
- tendon profile** — the path or trajectory of the prestressing tendon.
- tensile strain capacity** — the maximum tensile strain that hardened cement paste, mortar, or concrete can sustain before cracking occurs.
- tensile strength** — maximum stress that a material is capable of resisting under axial tensile loading based on the cross-sectional area of the specimen before loading.
- tension reinforcement** — reinforcement designed to carry tensile stresses such as those in the bottom of a simple beam.
- ternary mixture** — concrete containing three cementitious materials.
- terrazzo concrete** — marble-aggregate concrete that is cast-in-place or precast and ground smooth for decorative surfacing purposes on floors and walls.
- test** — a trial, examination, observation, or evaluation used as a means of measuring either a physical or a chemical characteristic of a material, or a physical characteristic of either a structural element or a structure.
- tetracalcium aluminoferrite** — a compound in the calcium aluminoferrite series, having the composition  $4\text{CaO}\cdot\text{Al}_2\text{O}_3\cdot\text{Fe}_2\text{O}_3$ , abbreviated C4AF, that is usually assumed to be the aluminoferrite present when compound calculations are made from the results of chemical analysis of portland cement. (See also **brownmillerite**.)
- texture** — the pattern or configuration apparent in an exposed surface, as in concrete and mortar, including roughness, streaking, striation, or departure from flatness.
- texturing** — the process of producing a special texture on either unhardened or hardened concrete.

- thermal conductance** — (of a gas, liquid, or solid) a measure of the rate at which heat passes perpendicularly through a unit area of material of specified thickness for a temperature difference of one degree.
- thermal conductivity** — the ability of a homogeneous material to conduct heat, measured as the steady state heat flow per unit area through a body of unit thickness with one degree temperature difference between the surfaces.
- thermal contraction** — contraction caused by decrease in temperature.
- thermal diffusivity** — (1) thermal conductivity divided by the product of specific heat and density; (2) an index of the ease which a material undergoes temperature change.
- thermal expansion** — expansion caused by increase in temperature.
- thermal movement** — change of dimension of concrete or masonry resulting from change of temperatures. (See also **thermal contraction** and **thermal expansion**.)
- thermal resistance** — the reciprocal of thermal conductance expressed by the symbol *R*.
- thermal shock** — the subjection of newly hardened concrete to a rapid change in temperature that may cause surface cracking.
- thermal stress** — see **temperature stress**.
- thermal volume change** — the increase or decrease in volume caused by changes in temperature. (See **thermal contraction** and **thermal expansion**.)
- thermoplastic** — capable of being repeatedly softened by heating and hardened by cooling.
- thermosetting** — becoming rigid by chemical reaction and not remeltable.
- thin-shell precast** — precast concrete characterized by thin slabs and web sections.
- thixotropy** — a property of a material to thin upon isothermal agitation and to thicken upon subsequent rest.
- threaded anchorage** — an anchorage device that is provided with threads to facilitate attaching the jacking device and to affect the anchorage.
- tie** — (1) loop of reinforcing bars encircling the longitudinal steel in columns; (2) a tensile unit adapted to holding concrete forms secure against the lateral pressure of unhardened concrete; (3) a tension member in a strut-and-tie model.
- tie bar** — bar at right angles to and tied to reinforcement to keep it in place.
- tie rod** — see **form tie** and **tieback**.
- tieback** — a rod fastened to a deadman, a rigid foundation, or either a rock or soil anchor to prevent lateral movement of formwork, sheet pile walls, retaining walls, and bulkheads.
- tied column** — a column laterally reinforced with ties.
- tilting mixer** — a revolving-drum mixer that discharges by tilting the drum about a fixed or movable horizontal axis at right angles to the drum axis; the drum axis may be horizontal or inclined while charging and mixing.
- tilt-up** — a construction technique for casting concrete elements in a horizontal position at the job site and then tilting them to their final position in a structure.
- time of haul** — in production of ready mixed concrete, the period from first contact between mixing water and cement until completion of discharge of the freshly mixed concrete.
- time of setting** — (1) the time required for a freshly mixed cement paste, mortar, or concrete to achieve initial setting (see **initial setting**); (2) the time required for a freshly mixed cement paste, mortar, or concrete to achieve final set. (See also **final setting**.)
- time-dependent deformation** — deformation resulting from effects such as autogenous volume change, thermal contraction or expansion, creep, shrinkage, and swelling, each of which is a function of time.
- tobermorite gel** — the binder of concrete cured moist or in atmospheric-pressure steam, a lime-rich gel-like solid containing 1.5 to 1.0 mols of lime per mol of silica.
- tolerance** — the permitted deviation from a specified dimension, location, or quantity.
- tom** — see **shore** (preferred term).
- tongue and groove** — a joint in which a protruding rib on the edge of one side fits into a groove in the edge of the other side, abbreviated T & G. (See also **keyway**.)
- tooling** — the act of compacting and contouring a material in a joint.

- top form** — form required on the upper or outer surface of a sloping slab or thin shell.
- topping** — (1) a layer of concrete or mortar placed to form a floor surface on a concrete base; (2) a structural, cast-in-place surface for precast floor and roof systems; (3) the mixture of marble chips and matrix that, when properly processed, produces a terrazzo surface.
- torque viscometer** — an apparatus used for measuring the consistency of slurries in which the energy required to rotate a device suspended in a rotating cup is proportional to viscosity.
- torsional stress** — the shear stress on a transverse cross section resulting from a twisting action.
- toughness** — (1) the ability of a material to absorb energy without rupturing; (2) the amount of energy per unit volume of material required to rupture the material.
- traditional mass concrete** — mass concrete for construction such as dams where issues with heat generation have been observed with sequential placements having large dimensions that trapped a lot of heat; concrete used for these types of placement that generally have a relatively lower cementitious materials content, lower temperature rise, lower or later-age design strength requirements, and/or large maximum coarse aggregate size.
- transducer** — device that can both sense and transmit a physical process.
- transfer** — to shift the tensioning force for a strand or strands from a jack or pretensioning bed to a concrete or masonry member.
- transfer bond** — in pretensioning, the bond stress resulting from the transfer of stress from the tendon to the concrete.
- transfer length** — the length from the end of the member where the tendon stress is zero to the point along the tendon where the prestress is fully effective.
- transfer strength** — the concrete strength required before stress is transferred from the stressing mechanism to the concrete.
- transit mixer** — see **truck mixer**.
- transit-mixed concrete** — concrete that is mixed totally or mostly in a truck mixer.
- translucent concrete** — a combination of glass and concrete used together in precast and prestressed panels.
- transmission length** — see **transfer length**.
- transverse crack** — a crack that occurs across the longer dimension of the member.
- transverse joint** — a joint normal to the longitudinal dimension of a structural element, assembly of elements, slab, or structure.
- transverse prestress** — prestress that is applied at right angles to the longitudinal axis of a member or slab.
- transverse reinforcement** — reinforcement at right angles to the longitudinal reinforcement.
- transverse strength** — see **flexural strength** and **modulus of rupture**.
- traprock** — any of various fine-grained, dense, dark-colored igneous rocks, typically basalt or diabase (also called trap).
- trass** — a natural pozzolan of volcanic origin found in Germany—namely, trachytic tuffs that are intensely altered by geologic processes.
- traveler** — an inverted-U-shaped structure usually mounted on tracks that permit it to move from one location to another to facilitate the construction of an arch, bridge, or building.
- travertine** — dense to irregularly porous, commonly stratified or banded calcium carbonate, either aragonite or calcite, formed by deposition from hot spring waters.
- tremie** — a pipe extending below water, generally with a funnel-shaped top, through which concrete can be deposited.
- tremie seal** — (1) the depth to which the discharge end of the tremie pipe is kept embedded in the fresh concrete that is being placed; (2) a layer of tremie concrete placed in a cofferdam for the purpose of preventing the intrusion of water when the cofferdam is dewatered.

- trench form** — the vertical sides and semicircular bottom of a trench excavated through compacted soil to provide the exterior form and base for a cast-in-place concrete pipe.
- trial batch** — a batch of concrete prepared to establish acceptable proportions of the constituents.
- triaxial compression test** — a test in which a specimen is subjected to a confining hydrostatic pressure and then loaded axially to failure.
- triaxial test** — a test in which a specimen is subjected simultaneously to lateral and axial loads.
- tricalcium aluminate** — a compound having the composition  $3\text{CaO}\cdot\text{Al}_2\text{O}_3$ , abbreviated  $\text{C}_3\text{A}$ .
- tricalcium silicate** — a compound having the composition  $3\text{CaO}\cdot\text{SiO}_2$ , abbreviated  $\text{C}_3\text{S}$ , an impure form of which (alite) is a main constituent of portland cement. (See also **alite**.)
- trough mixer** — see **open-top mixer** (preferred term).
- trowel** — (1) a flat, broad-blade steel hand tool used in the final stages of finishing operations to impart a relatively smooth surface to concrete floors and other unformed concrete surfaces; (2) a flat, triangular-blade tool used for applying mortar; (3) a flat, broad-blade steel hand tool used to place, spread, shape, finish, or otherwise apply materials. (See also **fresno trowel**.)
- trowel finish** — the smooth finish of an unformed concrete surface obtained by troweling.
- troweling** — smoothing and compacting the unformed surface of fresh concrete by strokes of a trowel.
- troweling machine** — a motor-driven device that operates orbiting steel trowels on radial arms from a vertical shaft.
- truck mixer** — a concrete mixer suitable for mounting on a truck chassis and capable of mixing concrete in transit. (See also **horizontal-shaft mixer**, **inclined-axis mixer**, **open-top mixer**, and **agitator**.)
- truck-mixed concrete** — see **transit-mixed concrete**.
- T-shore** — a shore with a T-head.
- tub mixer** — see **open-top mixer** (preferred term).
- tube-and-coupler shoring** — a load-carrying assembly of tubing or pipe that serves as posts, braces, and ties, a base supporting the posts, and special couplers that connect the uprights and join the various members.
- tunnel lining** — a structural system of concrete, steel, or other materials to provide support for a tunnel for exterior loads, to reduce water seepage, or to increase flow capacity.
- turbidimeter** — a device for measuring the particle-size distribution of a finely divided material by taking successive measurements of the turbidity of a suspension in a fluid.
- turbidimeter fineness** — the fineness of a material such as portland cement, usually expressed as total surface area in square centimeters per gram, as determined with a turbidimeter. (See also **Wagner fineness**.)
- turbine mixer** — see **open-top mixer** (preferred term).
- twin-twisted bar reinforcement** — two bars of the same nominal diameter twisted together.
- two-way reinforced footing** — a footing having reinforcement in two directions generally perpendicular to each other.
- two-way reinforcement** — reinforcement arranged in bands of bars at right angles to each other.
- two-way system** — a system of reinforcement; bars, rods, or wires placed at right angles to each other in a slab and intended to resist stresses due to bending of the slab in two directions.
- Type I cement** — see **normal cement**.
- Type II cement** — see **modified cement**.
- Type III cement** — see **high-early-strength cement**.
- Type IV cement** — see **low-heat cement**.
- Type V cement** — see **sulfate-resistant cement**.
- ultimate load** — the maximum load that may be placed on a structure or structural element before its failure.
- ultimate moment** — (obsolete) see **nominal flexural strength**.

- ultimate shear strength** — (obsolete) see **nominal shear strength**.
- ultimate shear stress** — see **shear strength**.
- ultimate strength** — the maximum stress developed in a specimen.
- ultimate-strength design** — see **strength-design method**.
- ultimate tensile strength (UTS)** — ultimate tensile strength of a fiber-reinforced concrete sample under uniaxial tension.
- ultra-high-performance concrete** — concrete that has a minimum specified compressive strength of 22,000 (150 MPa) with specified durability, tensile ductility, and toughness requirements; fibers are generally included to achieve specified requirements.
- ultrasonic** — pertaining to mechanical vibrations having a frequency greater than approximately 20,000 Hz.
- unbonded member** — a prestressed-concrete member post-tensioned with tendons that are not bonded to the concrete between the end anchorages after stressing.
- unbonded post-tensioning** — post-tensioning in which the tendons are not grouted after stressing.
- unbonded tendon** — a tendon that is permanently prevented from bonding to the concrete after stressing.
- unbraced length of column** — distance between lateral supports.
- underbed** — the base mortar, usually horizontal, into which strips are embedded and on which terrazzo topping is applied.
- undersanded** — concrete containing an insufficient proportion of fine aggregate to produce optimum properties in the fresh mixture, especially workability and finishing characteristics.
- undersize** — particles of aggregate passing a designated sieve.
- underwater concrete** — concrete placed underwater by tremie or other means.
- unhardened concrete** — see **fresh concrete** (preferred term).
- unit masonry** — a construction element consisting of masonry units.
- unit water content** — the quantity of water per unit volume of freshly mixed concrete excluding water absorbed by the aggregate.
- unit weight** — (deprecated term) see **density**.
- unreinforced concrete** — see **plain concrete**.
- unsound** — not firmly made, placed, or fixed; subject to deterioration or disintegration during service exposure.
- U-value** — overall coefficient of heat transmission; a standard measure of the rate at which heat will flow through a unit area of a material of known thickness.
- vacuum concrete** — concrete from which excess water and entrapped air are extracted by a vacuum process before setting occurs.
- vacuum dewatering** — see **vacuum concrete**.
- vacuum grouting** — a process by which a partial vacuum is generated within a void to create a pressure differential that allows grout to flow into and substantially fill the void through a single grout inlet.
- vacuum saturation** — a process for increasing the moisture content of lightweight aggregate by subjecting it to a vacuum in a sealed chamber, flooding the chamber with water, and releasing the vacuum.
- valve bag** — paper bag for cement or other material, either glued or sewn, made of four or five plies of kraft paper and completely closed except for a self-sealing paper valve through which the contents are introduced and released.
- vapor barrier** — membrane located under a concrete floor slab that is placed on the ground to retard transmission of water vapor.
- vapor pressure** — the pressure exerted when a vapor is in equilibrium with its liquid or solid form at a given temperature.
- vapor retarder** — a membrane that impedes the transmission of gas molecules.
- vebe apparatus** — an apparatus for measuring workability of very-low-slump or no-slump concrete, including a vibrating table, a sample container, and other ancillary items, that permits measurement of the time (vebe time) required to be consolidated in a mold.
- vehicle** — liquid carrier or binder of solids.
- veneer** — a masonry facing that is attached to the backup, but not so bonded as to act with it under load.

- Venetian** — a type of terrazzo topping that incorporates large chips of stone.
- vermiculite** — (1) a micaceous mineral; (2) a group name for certain platy minerals, hydrous silicates of aluminum, magnesium, and iron characterized by marked exfoliation on heating; (3) a constituent of clays.
- vertical-shaft mixer** — a cylindrical or annular mixing compartment having an essentially level floor and containing one or more vertical rotating shafts to which blades or paddles are attached; the mixing compartment may be stationary or rotate about a vertical axis.
- vibrated concrete** — concrete consolidated by vibration during and after placing.
- vibration** — energetic agitation of freshly mixed concrete during placement by mechanical devices, either pneumatic or electric, that create vibratory impulses of moderately high frequency to assist in consolidating the concrete in the form or mold.
- (1) *external vibration* — employs vibrating devices attached at strategic positions on the forms and is particularly applicable to manufacture of precast items and for vibration of tunnel-lining forms; in manufacture of concrete products, external vibration or impact may be applied to a casting table.
- (2) *internal vibration* — employs one or more vibrating elements that can be inserted into the fresh concrete at selected locations and is more generally applicable to in-place construction.
- (3) *surface vibration* — employs a portable horizontal platform on which a vibrating element is mounted.
- vibration limit** — the age at which fresh concrete has undergone a sufficient degree of setting and developed adequate strength to resist flow when subjected to vibration.
- vibrator** — an oscillating machine used to agitate fresh concrete so as to eliminate gross voids, including entrapped air but not entrained air, and to produce intimate contact with form surfaces and embedded materials. (See also **vibration**.)
- Vicat apparatus** — a penetration device used in the testing of hydraulic cements and similar materials.
- Vicat needle** — a weighted needle for determining time of setting of hydraulic cements.
- viscometer** — instrument for determining viscosity of slurries, mortars, or concretes.
- viscosity** — a measure of the resistance of a fluid to deform under shear stress.
- visual concrete** — see **architectural concrete**.
- void-cement ratio** — volumetric ratio of air plus net mixing water to cement in a concrete or mortar mixture.
- volatile material** — material that is subject to release as a gas or vapor; liquid that evaporates readily.
- volume batching** — combining the constituents of mortar or concrete based on volumetric measurement. (See also **volumetric measuring**.)
- volume change** — an increase or decrease in volume due to any cause. (See also **deformation** and **time-dependent deformation**.)
- volumetric measuring** — dispensing an ingredient based on volume, either in discrete quantities or by continuous flow.
- volumetric mixer** — equipment that uses measurements based on the volumes of the ingredients to feed a container that continually agitates and combines those ingredients for the production of concrete (also called volumetric-measuring and continuous-mixing concrete equipment [VMCM]).
- w/c* — see **water-cement ratio**.
- w/cm* — see **water-cementitious materials ratio**.
- waffle** — see **dome**.
- Wagner fineness** — the fineness of portland cement, expressed as total surface area in square centimeters per gram, determined by the Wagner turbidimeter apparatus and procedure.
- wale** — a long formwork member (usually double) used to gather loads from several studs (or similar members) to allow wider spacing of the restraining ties; when used with prefabricated panel forms, this member is used to maintain alignment.
- wall** — a vertical element used primarily to enclose or separate spaces.

- wall form** — a retainer or mold so erected as to give the necessary shape, support, and finish to a concrete wall.
- warehouse pack** — see **warehouse setting** and **sticky cement**.
- warehouse setting** — (1) the partial hydration of cement stored for a time and exposed to atmospheric moisture; (2) mechanical compaction occurring during storage. (See also **sticky cement**.)
- warping** — out-of-plane deformation of the corners, edges, and surface of a pavement, slab, or wall panel from its original shape, caused by a normally-occurring combination of differences in moisture content and temperature between the two surfaces of the panel; taken independently, temperature differentials result in curling and moisture differentials result in warping. (See also **curling**.)
- warping joint** — a joint with the sole function of permitting warping of pavement slabs when moisture and temperature differentials occur between the top and bottom of the slabs, that is, longitudinal or transverse joints with bonded steel or tie bars passing through them.
- wash water** — water carried on a truck mixer in a special tank for flushing the interior of the mixer after discharge of the concrete.
- water blast** — a system of cutting or abrading a surface such as concrete by a stream of water ejected from a nozzle at high velocity.
- water pocket** — see **water void**.
- water ring** — a device in the nozzle body of dry-mix shotcrete equipment through which water is added to the materials.
- water void** — void along the underside of an aggregate particle or reinforcing steel that formed during the bleeding period, initially filled with bleed water.
- water-cement ratio** — the ratio of the mass of water, exclusive only of that absorbed by the aggregates, to the mass of portland cement in a cementitious mixture, stated as a decimal and abbreviated as *w/c*. (See also **water-cementitious materials ratio**.)
- water-cementitious materials ratio** — the ratio of the mass of water, excluding that absorbed by the aggregate, to the mass of cementitious material in a mixture, stated as a decimal and abbreviated *w/cm*. (See also **water-cement ratio**.)
- waterproof** — an idealized property of a material indicating imperviousness to water in either liquid or vapor state. (See also **dampproofing**.) Note: because nothing can be completely impervious to water under infinite pressure over infinite time, this term should not be used.
- waterproofed cement** — see **water-repellent**.
- waterproofing** — see **dampproofing** (preferred term).
- waterproofing compound** — material used to impart water repellency to a structure or a constructional unit.
- water-reducing admixture** — an admixture that either increases slump of freshly mixed mortar or concrete without increasing water content, or maintains slump with a reduced amount of water, the effect being due to factors other than air entrainment.
- water-repellent** — property of a surface that resists wetting (by matter in either liquid or vapor state) but permits passage of water when hydrostatic pressure occurs. (See also **watertight**.)
- water-resistant** — see **water-repellent** (preferred term).
- waterstop** — a thin sheet of metal, rubber, plastic, or other material inserted across a joint to obstruct the seepage of water through the joint.
- watertight** — impermeable to water except when under hydrostatic pressure sufficient to produce structural discontinuity by rupture.
- wearing course** — a topping or surface treatment to increase the resistance of a concrete pavement or slab to abrasion.
- weathering** — changes in color, texture, strength, chemical composition, or other properties of a natural or artificial material due to the action of the weather.
- web bar** — see **web reinforcement** (preferred term).
- web reinforcement** — reinforcement placed in a concrete member to resist shear and diagonal tension.

- wedge** — a piece of wood or metal tapering to a thin edge, used to adjust elevation or tighten formwork.
- wedge anchorage** — a device for anchoring a tendon by wedging.
- weigh batching** — measuring the constituent materials for mortar or concrete by mass.
- weigh-in-motion** — process that uses devices to capture and record the axle and gross vehicle weights when vehicles drive over them at highway speed.
- welded-butt splice** — a reinforcing bar splice made by welding the butted ends.
- welded-wire fabric** — (obsolete) see **welded-wire reinforcement** (preferred term).
- welded-wire reinforcement** — a series of longitudinal and transverse wires arranged approximately at right angles to each other and welded together at all points of intersection.
- well-graded aggregate** — aggregate having a particle-size distribution that produces high density—that is, low void space.
- wet** — covered with visible free moisture.
- wet density** — the unit weight of grout in its plastic state.
- wet process** — in the manufacture of cement, the process in which the raw materials are ground, blended, mixed, and pumped while mixed with water. (See also **dry process**.)
- wet screening** — screening to remove from fresh concrete aggregate particles larger than a certain size.
- wet sieving** — use of water to facilitate sieving of a granular material on standard sieves.
- wet-cast process** — a process for producing concrete items, such as pipe, that uses concrete having a measurable slump, generally placed from above, and consolidated by vibration. (See also **centrifugal process**, **dry-cast process**, **packerhead process**, and **tamp process**.)
- wet-mix shotcrete** — shotcrete in which the ingredients, including water, are mixed before introduction into the delivery hose (also called wet-process shotcrete).
- wettest stable consistency** — the condition of maximum water content at which cement grout and mortar will adhere to a vertical surface without sloughing.
- wetting agent** — a substance capable of lowering the surface tension of liquids, facilitating the wetting of solid surfaces and permitting the penetration of liquid into the capillaries.
- wheel load** — the portion of the gross mass of a loaded vehicle transferred to the supporting structure under a given wheel of the vehicle.
- white cement** — portland cement that hydrates to a white paste; made from raw materials of low iron content, the clinker for which is fired by a reducing flame.
- wind load** — pressure or suction due to wind on part of or the entire surface of a structure.
- wing pile** — a bearing pile, usually of concrete, widened in the upper portion to form part of a sheet pile wall.
- wire mesh** — see **welded-wire reinforcement**.
- wire wrapping** — application of high tensile wire, wound under tension by machines, around circular concrete or shotcrete walls, domes, or other tension-resisting structural components.
- wobble coefficient** — a coefficient used in determining the friction loss occurring in post-tensioning, which is assumed to account for the secondary curvature of the tendons.
- wobble friction** — in prestressed concrete, the friction caused by the unintended deviation of the prestressing sheath or duct from its specified profile.
- work** — entire construction or separately identifiable parts thereof required to be furnished under contract documents.
- workability** — that property of freshly mixed concrete or mortar that determines the ease with which it can be mixed, placed, consolidated, and finished to a homogenous condition.
- working load** — forces normally imposed on a member in service.
- working stress** — maximum permissible design stress using working-stress design methods.
- working-stress design** — a method of proportioning either structures or members for prescribed service loads and assuming linear stress-strain relationships for the materials. (See also **elastic design**.)
- woven-wire fabric** — see **woven-wire reinforcement**.

- woven-wire reinforcement** — a prefabricated steel reinforcement composed of cold-drawn steel wires mechanically interlaced to form shape openings.
- wrapping** — see **strand wrapping** and **wire wrapping**.
- wythe (leaf)** — each continuous vertical section of a wall that is one masonry unit or grouted space in thickness.
- X-brace** — paired set of crossing sway braces. (See also **brace**, **cross bracing**, and **sway brace**.)
- xonotlite** — calcium silicate monohydrate ( $\text{Ca}_6\text{Si}_6\text{O}_{17}(\text{OH})_2$ ), a natural mineral that is readily synthesized at 302 to 662°F (150 to 350°C) under saturated steam pressure; a constituent of sand-lime masonry units.
- X-ray diffraction** — (1) the diffraction of X-rays by substances having a regular arrangement of atoms; (2) a phenomenon used to identify substances having a regular arrangement of atoms.
- X-ray emission spectroscopy** — see **X-ray fluorescence**.
- X-ray fluorescence** — characteristic secondary radiation emitted by an element as a result of excitation by X-rays, used to yield chemical analysis of a sample.
- yellowing** — development of yellow color or cast in white or clear coatings as a consequence of aging.
- yield** — (1) the volume of freshly mixed concrete produced from a known quantity of ingredients; (2) the total mass of ingredients divided by the density mass of the freshly mixed concrete; (3) the number of units produced per bag of cement or per batch of concrete.
- yield point** — the first engineering stress in a test in which stresses and strains are determined for a material that exhibits the phenomenon of discontinuous yielding, of which an increase in strain occurs without an increase in stress.
- yield strength** — the stress at which a material exhibits a specific limiting deviation from the proportionality of stress to strain.
- yield stress** — critical shear stress value below which an ideal plastic or viscoplastic material behaves like a solid (that is, will not flow); once the yield stress is exceeded, a plastic material yields (deforms plastically), while a viscoplastic material flows like a liquid.
- yield stress at rest** — represents static yield stress of the material—that is, minimum shear stress needed to initiate flow measured after a given time of rest.
- yoke** — (1) a tie or clamping device around column forms or over the top of wall or footing forms to keep them from spreading because of the lateral pressure of fresh concrete; (2) part of a structural assembly for slipforming that keeps the forms from spreading and transfers form loads to the jacks.
- zero-slump concrete** — concrete of stiff or extremely dry consistency showing no measurable slump after removal of the slump cone. (See also **slump** and **no-slump concrete**.)