

ICRI CONCRETE REPAIR TERMINOLOGY

2010

—A—

abrasion damage—surface deterioration caused by rubbing and friction against the surface.

abrasive—any hard, strong substance, such as rocks, sand, water, or minerals, that will cut, scour, pit, erode, or polish another substance.

abrasive blasting—a process for roughening, cleaning, or finishing a surface by propelling an abrasive medium at high velocity against it; commonly used methods include **sandblasting**, **shotblasting**, and **high-pressure water blasting**.

absorbed moisture—see **moisture, absorbed**.

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

accelerated aging—deteriorating a material at a faster-than-normal rate by subjecting the material to specified accelerated test conditions.

accelerator—see **admixture, accelerating**.

acceptance test—a test conducted to determine whether an individual lot of materials conforms to specifications or to determine the degree of uniformity of the material, or both.

acid etching—application of acid to clean or alter a concrete surface; typically used only when no alternative means of surface preparation can be used.

acoustic emission—sounds, both audible and subaudible, that are generated when a material undergoes irreversible changes, such as cracking in concrete; provides the basis for a nondestructive monitoring technique.

acoustic monitoring—a type of nondestructive testing technology whereby transient elastic waves within a material due to localized stress release in a material, or on its surface, are detected and monitored.

acoustic impact—a method used to detect the presence of delaminations or subsurface voids in concrete based on the sounds made by the concrete upon impact. (See also **chain drag** and **sounding**.)

acoustic triangularization—identification of the location of an acoustic emission by triangularization from multiple sensors.

acrylic resin—see **resin, acrylic**.

activator—a material that actuates a catalyst.

active crack—see **crack, active**.

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additive—a substance added to another in relatively small amounts to impart or improve desirable properties or suppress undesirable properties; any material other than the basic components of a grout system.

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

adhesive failure—see **failure, adhesive**.

adhesives—the group of materials used to cause similar or dissimilar materials to cohere.

admixture—a material other than water, aggregates, hydraulic cement, or fiber reinforcement, added to concrete, mortar, or grout, during batching or mixing to enhance plastic or hardened material properties, or both.

admixture, accelerating—an admixture that (1) increases the rate of hydration of the hydraulic cement and thus shortens the time of setting, increases the rate of strength development, or both; (2) any substance that increases the rate of a chemical reaction.

admixture, air-entraining—an admixture that creates microscopic air bubbles in concrete, mortar, or cement paste during mixing; used to increase the workability and freeze-thaw resistance of the mixture.

admixture, alkali-aggregate reaction inhibiting—an admixture that reduces expansion caused by alkali-aggregate reaction.

admixture, antiwashout—an admixture that increases the cohesiveness of concrete to be placed under water, thus inhibiting the amount of fines washed away from the aggregates when the concrete comes in contact with water.

admixture, corrosion inhibiting—an admixture that reduces ingress of chlorides or enhances the passivating layer on the surface of steel reinforcement, or both, thus reducing or preventing corrosion.

admixture, retarding—an admixture that decreases the rate of hydration of hydraulic cement and increases the time of setting.

admixture, shrinkage reducing—an admixture that reduces drying shrinkage by reducing the surface tension of water in the pore structure of cement paste.

admixture, viscosity modifying—an admixture that can be used to produce self-leveling concrete that remains cohesive without excessive bleeding, segregation, or abnormal retardation.

admixture, water-reducing—an admixture that either increases workability of freshly mixed mortar or concrete without increasing water content or maintains a given workability with a reduced amount of water.

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admixture, water reducing (high-range)—an admixture capable of producing large water reduction or great workability without causing undue set retardation or entrainment of air in mortar or concrete.

adsorption—development (at the surface of either a liquid or solid) of a higher concentration of a substance than exists in the bulk of the medium; especially formation of one or more layers of molecules of gases, of dissolved substances, or of liquids at the surface of a solid (such as cement, cement paste, or aggregates), or of air-entraining agents at the air-water interfaces; also the process by which a substance is adsorbed. (See also **water, adsorbed**.)

advancing-slope grouting—see **grouting, advancing-slope**.

age hardening—the progressive change in the chemical and physical properties of an adhesive leading to embrittlement. (See also **aging**.)

aggregate—granular material such as sand, gravel, crushed stone, crushed hydraulic-cement concrete, or iron blast-furnace slag which is used with a hydraulic cementing medium or polymer binder to produce either concrete or mortar.

aggregate, coarse—(1) aggregate predominantly retained on the No. 4 (4.75-mm) sieve; or (2) that portion of an aggregate retained on the No. 4 (4.75-mm) sieve.

aggregate, fine—aggregate passing the 3/8-in. (9.5-mm) sieve and almost entirely passing the No. 4 (4.75-mm) sieve and predominantly retained on the No. 200 (75- μ m) sieve; or (2) that portion of an aggregate passing the No. 4 (4.75-mm) sieve and retained on the No. 200 (75- μ m) sieve.

aggregate, gap-graded—aggregate graded so that certain intermediate sizes are substantially absent.

aggregate, reactive—aggregate containing substances capable of reacting with the alkalis in portland cement; products of the reaction may cause abnormal expansion and cracking of concrete or mortar under certain service conditions.

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

aging—the cumulative effects of time on the properties of materials or substances.

agitation—the mixing and homogenization of slurries or finely ground powders by either mechanical means or injection of air.

agitator—a device for maintaining plasticity and preventing segregation of mixed grout, mortar, or concrete by shaking or stirring.

agitator tank—a vertical, open-top tank equipped with rotation blades used to prevent segregation of mixed grout.

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air—

air, entrained—microscopic air bubbles intentionally incorporated in mortar or concrete during mixing; bubbles are typically spherical with a maximum diameter of 1 mm.

air, entrapped—air voids in concrete that are not purposely entrained and that are larger, mainly irregular in shape, and less useful than those of entrained air; and 1 mm or larger in size.

air barrier—the material (liquid or sheet) that controls air leakage into or out of concrete and masonry wall systems.

air-entraining admixture—see **admixture, air-entraining**.

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 entrainment—the deliberate addition of microscopic air bubbles (generally smaller than 1 mm) to concrete or mortar during the mixing. (See also **admixture, air-entraining**.)

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

air-water jet—a high-velocity jet of air and water mixed at the nozzle, used to clean surfaces or remove deteriorated concrete; water sprayed at pressures less than 5,000 psi (35 MPa) will remove dirt and loose, friable material; water sprayed at pressures between 5,000 and 45,000 psi (35 - 300 MPa) will remove heavy encrustations of dirt and loose, friable material, including deteriorated concrete.

alignment wire—see **ground wire**.

alkali—salts of alkali metals, specifically sodium and potassium, occurring in constituents of concrete and mortar; usually expressed in chemical analyses as the oxides Na_2O and K_2O .

alkali-aggregate reaction—a chemical reaction between alkalies (sodium and potassium) from portland cement or other sources and certain constituents of some aggregates that can cause abnormal expansion and cracking of concrete or mortar under certain service conditions.

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.

alligator cracks—see **cracks, alligator**.

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ambient—surrounding natural conditions or environment in a given place and time.

anchor—a metal bolt, stud, threaded rod, or reinforcing steel, either cast in place, grouted in place, or drilled into hardened concrete, used to prevent dislodging of repairs from concrete substrate in the event of a bond failure; to hold various structural members or embedments in the concrete; and to resist shear, tension, and vibration loadings.

anchor, bonded—a post-installed anchor installed in holes drilled into the concrete substrate and embedded with portland cement grout or polymer materials such as polyesters, vinyl esters, or epoxies.

anchor, embedment depth—distance from the member surface to the installed end of the anchor prior to the setting of the anchor.

anchor, expansion—a post-installed anchor designed to be inserted into a predrilled hole and then expanded by tightening a nut, hammering the anchor, or expanding into an undercut in the concrete.

anchorage—in post-tensioning, a device used to anchor the tendon to the concrete member; in pretensioning, a device used to maintain the elongation of a tendon during the time interval between stressing and release.

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

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

anisotropic—exhibiting different physical properties in different directions.

anode—the electrode in electrolysis at which negative ions are discharged, positive ions are formed, or other oxidizing reactions occur.

anode, sacrificial—chemically active metals such as zinc, aluminum, and magnesium which, when electrically connected to the reinforcing bar, will provide the energy needed to cathodically protect the reinforcing bar; sacrificial anodes deteriorate in service at a rate proportional to the energy needed to protect the reinforcing bar plus whatever may deteriorate by local-action corrosion.

anodic inhibitor—an inhibitor that reduces the corrosion rate by acting on the anodic (oxidation) reaction.

anodic protection—a technique to reduce the corrosion rate of a metal by polarizing it into its passive region where dissolution rates are low.

anodic reaction—corrosion reaction involving dissolution of metal into metal ions with the corresponding release of electrons; also sometimes referred to as oxidation.

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anodic ring effect—corrosion process in which the steel reinforcement in concrete surrounding a repair area begins to corrode preferentially to reinforcement in the newly repaired area (sometimes referred to as the halo effect).

anticoagulant—a substance which prevents the coagulation of a colloid suspension or emulsion; also called a stabilizer and latex preservative.

antifoaming agent—an additive used to increase surface tension and reduce foaming tendencies, particularly in admixtures and materials applied by roller coating equipment.

antiwashout admixture—see **admixture, antiwashout**.

application life—the period of time during which a material, after being mixed with a catalyst or exposed to the atmosphere, remains suitable for application.

application rate—the quantity (mass, volume, or thickness) of material applied per unit area.

aramid—a manufactured fiber in which the fiber-forming substance is a long-chain synthetic aromatic polyamide in which at least 85% amide linkages are attached directly to two aromatic rings.

articulated joint—see **joint, articulated**.

aspect ratio—the ratio of length to diameter of a fiber.

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

—B—

backer rod—a flexible, compressible rod placed in a joint to reduce the depth of sealant and improve its shape factor; it also serves to support the sealant against sagging and indentation.

backpack grouting—see **grouting, backpack**.

backup wall—the inner layer of a masonry wall system.

barrier wall—a wall system with two or more wythes of masonry with mortar-filled collar joint to form a solid wall.

base—primary material in a multi-component system.

batch—quantity of material (concrete, mortar, grout, etc.) mixed at one time.

batch method—a quantity of grout materials are mixed or catalyzed at one time prior to injection.

batch mixer—a machine that mixes batches of concrete, mortar, or grout, in contrast to a continuous mixer.

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batching—weighing or volumetrically measuring and introducing into the mixer the ingredients for a batch of either concrete or mortar.

bead—a strip of applied sealant, glazing compound, or putty.

bed joint—a horizontal mortar joint between a repair material and a substrate.

bentonite—a distinct type of fine-grained clay containing not less than 85% montmorillonite clay.

binders—cementing materials, either hydrated cements or products of cement or lime and reactive siliceous materials or other materials such as polymers that form the matrix of concretes, mortars, and sanded grouts.

Blaine fineness—the fineness of granular materials such as cement and pozzolan, expressed as total surface area in square centimeters per gram, determined by the Blaine air-permeability apparatus and procedure.

blanket grouting—see **grouting, blanket**.

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; used both in the manufacture of slag cement and as an aggregate for lightweight concrete.

bleaching—the fading of color toward white generally caused by exposure to chemicals or ultraviolet radiation.

bleeding—(1) the flow of mixing water within, or its emergence from newly placed concrete or mortar; (2) the absorption of oil resin or plasticizer from a compound into an adjacent porous surface; (3) the diffusion of color matter through a coating from underlying surfaces causing a color change.

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

blended cement—see **cement, blended**.

blistering—(1) the irregular raising of a thin layer at the surface of placed mortar or concrete during or soon after completion of the finishing operation; (2) bulging of the finish plaster coat as it separates and draws away from the base coat; (3) the formation of air or gas pockets trapped within a thin-film coating, elastomeric membrane, or any impervious membrane.

bloom—(1) a visible exudate of efflorescence on the surface of a material; (2) a haziness which develops on coated surfaces caused by the exudation of a component of the coating system.

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

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blushing—a coating defect which manifests itself as a milky appearance which is generally caused by rapid solvent evaporation or the presence of excessive moisture during the curing process.

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

bond—adhesion and grip of a material to other surfaces against which it is placed; adherence between repairs and existing substrates.

bond failure—fracture that results when applied force exceeds adhesion between two bonded surfaces such as a repair material or coating and concrete substrate.

bonded anchors—see **anchor, bonded**.

bond breaker—a material used to prevent adhesion at a designated interface.

bond line—the interface between two surfaces bonded together with an adhesive.

bond strength—see **strength, bond**.

bonding agent—a material applied to a suitable substrate to enhance bond between it and a succeeding layer.

boom-mounted breakers—see **concrete breakers, boom-mounted**.

borescope—a device composed of a rigid or flexible tube with mirrors and lenses that is inserted into a small drill hole or other access channel to provide a visual image of internal conditions.

brittle—a tendency to crack or break when subjected to deformation; frangible.

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

broom and seed—a method for application of polymer concrete in which alternate layers of resin and aggregate are built up to form an overlay.

bruised surface—a surface layer weakened by interconnected microcracks in concrete substrates caused by use of high-impact, mechanical methods for concrete removal and surface preparation; fractured layer typically extends to a depth of 1/8 to 3/8 in. (3 to 10 mm) and, if not removed, frequently results in lower bond strengths as compared to surfaces prepared with nonimpact methods.

bubbling—a temporary or permanent film defect in which bubbles of air or solvent vapor are present in the applied film.

bug holes—small cavities in the surface of formed concrete caused by entrapment of air bubbles during placement and consolidation; usually no larger than 5/8 in. (15 mm) in diameter.

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build—the wet or dry thickness of a coating or film.

build-up—placing material in layers to increase thickness.

bush-hammer—a serrated hammer with rows of pyramidal points used to roughen or dress a surface; to finish a surface with a bush-hammer.

buttonhead—a cold-formed flare at the end of individual wires in post-tensioning tendon that bears against an anchorage assembly; also the term used to describe an early-generation post-tensioning system that utilized cold formed buttons to anchor individual parallel wires in a tendon.

—C—

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

calcium chloride—a white, deliquescent, hygroscopic compound, CaCl_2 ; can be used, in various technical grades, as a drying agent, an accelerator, a deicing chemical, a refrigerant, and to prevent dust.

capillarity—the movement of a liquid in the interstices of concrete, soil, or other finely porous material due to surface tension.

capillary flow—flow of moisture through a capillary pore system, such as in concrete.

carbon fibers— see **fibers, carbon**.

carbonation—the conversion of calcium ions in hardened cementitious materials to calcium carbonate by reaction with atmospheric carbon dioxide in the presence of water (sufficient humidity); carbonation reduces the pH of the concrete and its ability to protect reinforcing steel and embedded metal items from corrosion.

cast-in-place—frequently used repair technique in which mortar, concrete, or other materials are deposited in workable condition in the place where they harden and become part of the structure.

catalyst—a substance that significantly increases the rate of curing of a binder when added in a small quantity relative to the amount of primary reactants.

catalyst system—those materials that, in combination, cause chemical reactions to begin; catalyst systems normally consist of an initiator (catalyst) and an activator.

cathode—the electrode at which electrons are consumed and chemical reduction occurs.

cathodic protection—a form of corrosion protection for steel in reinforced concrete wherein sufficient current is distributed to the reinforcement, thereby protecting the reinforcement from corrosion.

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cathodic protection, impressed current—a protection system that uses an external power supply to force a small amount of electric current through the reinforcing steel to counteract the flow of current caused by the corrosion process; a metal, such as platinum, niobium, coated titanium or a titanium sub-oxide that corrodes at a very slow rate, is typically provided as an anode.

cathodic protection, sacrificial—protection system that does not require an external power supply; a metal, such as zinc that is less noble or more prone to corrosion than steel, corrodes in place of the reinforcing steel thus protecting the structure.

caulk—to install or apply a sealant across or into joints, cracks, or crevices to prevent the passage of air or water.

cavitation damage—pitting of concrete caused by implosion of water vapor bubbles in fast-flowing water; bubbles form in areas of subatmospheric pressures immediately downstream from an obstruction or offset and collapse as they enter areas of higher pressure.

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

cement, blended—a hydraulic cement essentially consisting of portland cement, slag cement, or both, uniformly mixed with each other or a pozzolan through intergrinding or blending.

cement, calcium-aluminate—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.

cement, expansive—a type of cement that produces a paste that, after setting, increases in volume to a significantly greater degree than does portland-cement paste; used in some repair materials to compensate for drying shrinkage.

cement, high-early-strength—portland cement characterized by attaining a given level of strength in mortar or concrete earlier than does normal portland cement; referred to in the United States as Type III.

cement, hydraulic—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.

cement, magnesium phosphate—a blend of magnesium oxide and ammonium dihydrogen phosphate that reacts with water, rapidly producing strength and heat; rapid-setting cement that can be used at low temperatures.

cement, microfine—normally a proprietary blend of finely ground blast furnace slag and portland cement.

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cement, ordinary portland—the term used in the United Kingdom and elsewhere to designate the equivalent of American normal portland cement or Type I cement; commonly abbreviated OPC.

cement, portland—a hydraulic cement produced by pulverizing portland-cement clinker and usually containing calcium sulfate.

cement, regulated set—a hydraulic cement containing fluorine-substituted calcium aluminate, capable of very rapid setting.

cement, slag—granulated blast-furnace slag that has been finely ground and that is hydraulic cement.

cement, sulfate-resistant—portland cement with a low tricalcium aluminate content, which makes concrete more resistant to damage from dissolved sulfates in water or soils.

cement, white—portland cement which hydrates to a white paste, made from raw materials of low iron content.

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 **cement paste, neat**).

cement paste, neat—a mixture of hydraulic cement and water.

cementation process—pressure injection of cement grout into gravel, fractured rock, etc, to solidify it.

cementitious—having cementing properties.

chain drag—a nondestructive testing method in which the sounds from chains dragged over a concrete surface are used to detect delaminations; dull or hollow sounds indicate delaminated areas, whereas non-delaminated concrete exhibits a clear ringing sound. (See also **sounding** or, more broadly, **acoustic impact**.)

chalking—the loose powder caused by decomposition of a concrete surface or degradation of a coating.

charging—placing materials into a mixer or other container for further processing.

checking—see **cracks, checking**.

chemical attack—material degradation by reaction with, dissolution by, or reduction of physical continuity from contact with a chemical agent or agents.

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

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chemical compatibility—see **compatibility, chemical**.

chemical grout—see **grout, chemical**.

chemical grout system—any mixture of materials used for grouting purposes in which all elements of the system are true solutions (no particles in suspension).

chemical-resistant—the ability of a material to resist degradation by reaction with, dissolution by, or reduction of physical continuity from contact with a chemical agent or agents, thereby retaining its capacity to perform as a structural or aesthetic element.

chipping—to remove all or part of a hardened concrete section with a chisel.

chisel point—point with two major planes forming a “V” and a pair of minor planes on each flank; forming a hexagonal cross section.

chloride contamination—contamination of concrete with chloride ions commonly used in deicing salts and accelerating admixtures such as calcium chloride and sodium chloride; chloride contamination above the threshold for corrosion can result in corrosion of the reinforcing steel.

chloride content—total amount of chloride ion present in concrete or mortar.

chloride diffusion—the movement of chlorides over time within a concrete section due to concentration gradients.

chloride ion (Cl⁻)—anion of common deicing salts (sodium chloride) and of the accelerating admixtures calcium chloride.

chloride threshold—the amount of chloride required to initiate steel corrosion in reinforced concrete under a given set of exposure conditions; commonly expressed in percent of chloride ion by mass of cement.

chlorinated rubber—resin produced by the reaction of natural rubber with chlorine gas; coatings formulated from this resin have good resistance to acids, alkalis, and chemicals generally, but not to aromatic solvents, gasoline, etc.

chopped strand—rovings fibers that are chopped into short lengths for use in mats, spray-up, or molding compounds.

circuit grouting—see **grouting, circuit**.

cleanup—treatment of existing concrete substrate to remove all surface material and contamination down to a condition of cleanness corresponding to that of a freshly broken surface of concrete.

closure—achieving the desired reduction in grout take by splitting the hole spacing; if closure is being achieved, there will be a progressive decrease in grout take as primary, secondary, tertiary, and quaternary holes are grouted.

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coal tar—a material produced by the destructive distillation of coal; coal tar epoxies are coatings in which the binder is a combination of coal tar and epoxy resins.

coating—(1) liquid, with or without fillers or reinforcement, that is applied to a substrate by brushing, dipping, mopping, spraying, troweling, etc., to form a material that will bond to and preserve, protect, decorate, seal, or smooth the substrate; also used to provide a barrier to contain chemicals, (2) in unbonded post-tensioned concrete, a material used to lubricate steel tendons or protect against corrosion.

coating, high-build—protective surface treatment with a dry thickness greater than 10 mils (0.25 mm) and less than 30 mils (0.75 mm) applied to the surface of concrete.

coaxial dispenser—see **dispenser, coaxial**.

coefficient of friction—the ratio of the force required to move one surface over another, to the total force applied normal to those surfaces.

coefficient of permeability—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 68 °F (20 °C)).

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

cofferdam—a temporary structure enclosing all or part on a construction area so that construction or repair can proceed in the dry.

cohesion—the mutual attraction by which the molecules of a solid or liquid are held together.

cohesive failure—see also **failure, cohesive**.

cold joint—see **joint, cold**.

cold-weather concreting—special concreting and construction practices used to offset the limiting effects of cold conditions.

collar—(1) jackets which surround only a portion of a column or pier; typically used to provide increased support to the structural member at the top of the column or pier. (2) the surface opening of a borehole.

colloidal particle—an electrically charged particle, generally smaller than 0.1 mm, dispersed in a second continuous medium.

colloidal grout—see **grout, colloidal**.

communication—subsurface movement of grout from an injection hole to another hole or opening.

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compaction grout—see **grout, compaction**.

compatibility—(1) a balance of physical, chemical, and electrochemical properties and dimensions between a repair material and the existing substrate; (2) the capacity of two or more materials to combine or remain together without undesirable aftereffects; (3) mutual tolerance.

compatibility, chemical—any combination of materials that results in a chemically stable repair system.

compatibility, dimensional—a balance of dimensions, or volumetric stability, between a repair material and the existing substrate.

compatibility, electrochemical—a balance of electrochemical properties of two materials in contact.

compatibility, thermal—a balance of thermal properties between a repair material and the existing substrate.

composite—a product or system made from two or more constituent materials that remain distinct, but combine to form a material with properties not possessed by any of the individual constituents; e.g., a composite repair that includes a concrete substrate, adhesive bonding agent, and repair material.

composite construction—a type of construction with different materials and structural elements that are sufficiently interconnected that the combined components respond to loads as a unit.

compound—a mixture of a polymer with other ingredients such as fillers, stabilizers, catalysts, processing aids, lubricants, modifiers, pigments, or curing agents.

compression seal—a seal that is attained by a compressive force on the sealing material.

compressive strength—see **strength, compressive**.

concentration—amount of a constituent substance expressed in relationship to the whole.

concrete—a composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregate, usually a combination of fine aggregate and coarse aggregate; in portland cement concrete, the binder is a mixture of portland cement and water, with or without admixtures.

concrete, epoxy—a mixture of epoxy resin, curing agent, fine aggregate, and coarse aggregate. (See also **epoxy mortar** and **concrete, polymer**.)

concrete, fiber-reinforced—concrete containing dispersed, randomly oriented fibers.

concrete, fresh—unhardened concrete that can be consolidated by the intended method.

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concrete, high-early-strength—concrete that contains high-early-strength cement or admixtures which allow it to reach a specified strength earlier than normal concrete would.

concrete, high-strength—concrete that has a specified compressive strength for design of 8000 psi (55 MPa) or greater.

concrete, mass—any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change to minimize cracking.

concrete, plain—concrete without reinforcement.

concrete, polymer—a composite material in which the fine and coarse aggregates are bound together in a dense matrix with a polymer binder; also known as **resin concrete**.

concrete, polymer-modified—a mixture of water, hydraulic cement, aggregate, and a monomer or polymer; polymerized in place when a monomer is used.

concrete, preplaced-aggregate—concrete produced by placing coarse aggregate in a form and later injecting a portland cement-sand grout, usually with admixtures, to fill the voids.

concrete (mortar, grout), preshrunk—(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 hr before placing in order to reduce shrinkage during hardening.

concrete, prestressed—structural concrete in which internal stresses have been introduced to reduce potential tensile stresses resulting from loads.

concrete, pumped—concrete which is transported through a hose or pipe by means of a pump.

concrete, reinforced—concrete containing adequate reinforcement (prestressed or not prestressed) and designed on the assumption that the two materials act together in resisting forces.

concrete, roller-compacted—concrete compacted by roller compaction; concrete that, in its unhardened state, will support a roller while being compacted.

concrete, structural—concrete used to carry structural load or to form an integral part of a structure; concrete of a quality specified for structural use.

concrete, tremie—concrete placed underwater with a tremie pipe or hose.

concrete, vacuum—concrete from which excess water and entrapped air are extracted by a vacuum process before hardening occurs.

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concrete, zero-slump—concrete of stiff or extremely dry consistency showing no measurable slump after removal of the slump cone.

concrete breakers—hand-held or machine mounted equipment commonly used for removal of concrete by repeated striking of the surface to spall and fracture the concrete. (See also **scabblers**.)

concrete breakers, boom-mounted—mechanically operated equipment for removal of concrete by repeated, high energy and low-frequency striking of the surface to spall and fracture the concrete.

concrete breakers, hand-held—equipment commonly used for removal of concrete by repeated, low-energy and high-frequency striking of the surface to spall and fracture the concrete.

concrete breakers, impact—equipment for removal of concrete by repeated striking of the surface to spall and fracture the concrete; may produce microcracking in the concrete substrate.

condensed silica fume—see **silica fume**.

condition—to equalize the moisture in a material with that of a specified atmosphere.

condition assessment—investigation and appraisal of the condition of a structure; conclusions based on engineering judgment about the condition of a structure. (See also **condition survey, evaluation, and visual inspection**).

condition survey—quantitatively defining the physical condition of a structure, principally by visual inspection and nondestructive tests supplemented by sampling and laboratory testing.

conductivity, thermal—the property (of a homogeneous body) measured by the ratio of the steady-state heat flux (time-rate of heat flow per unit area) to the temperature.

consolidation—the process whereby the volume of freshly placed mortar or concrete is reduced to the minimum practical space, usually by vibration, rodding, tamping, or some combination of these actions; to mold mortar or concrete within a form or repair cavity and around embedded items and reinforcement and eliminate voids other than entrained air. (See also **rodding** and **tamping**.)

consolidation grouting—injection of a fluid grout, usually sand, portland cement, and water, into a compressible soil mass in order to displace it and form a lenticular grout structure for support.

constructibility—the extent to which the design of a repair and material properties facilitates ease of construction, achieving a quality repair at an economic cost.

construction joint—see **joint, construction**.

contact grouting—see **grouting, backpack**.

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

contamination—any extraneous material on or within a concrete substrate that can cause deterioration, inhibit bond, or adversely impact performance of any applied repair or protection system.

continuity, reinforcement—a condition in reinforced concrete in which the reinforcing steel is sufficiently interconnected to provide a path for electrical current.

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.

contract—a set of documents designed to define all aspects of the construction process. These documents typically consist of contract forms, contract conditions, specifications, drawings, addenda, and contract changes.

contract, change order—contract document to be signed by Owner, Design Professional and Contractor which confirms mutual agreement by all parties of modification to any contract terms (most typically changes to project work scope, cost and/or schedule).

contract, lump sum—agreement between an Owner and a Contractor which stipulates either a defined specific scope of services/work to be performed for a fixed payment amount or an open-ended scope with an intended end result to be performed for a fixed payment amount.

contract, time and materials—type of contract frequently used for evaluation investigations, or projects with potential hidden conditions and undefined scopes.

contract, unit price—agreement between an Owner and a Contractor for a defined set of work tasks where the total quantity of work is variable. The quantity of work for each category is estimated and work is paid for on a unit price basis such as \$/ft².

Contractor—person or entity that is under contract to the owner for the implementation of repairs to the structure.

contraction—a drawing together that reduces the volume or length of a mass or object.

contraction joint—see **joint, contraction**.

control joint—see **joint, contraction**.

controlled low-strength material—a self-compacted, cementitious material used primarily as a backfill in lieu of compacted fill.

conveying hose—see **delivery hose**.

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coping—the top layer or a covering on a wall or pier exposed to the weather, usually sloped to carry off water.

copolymerization—see **polymerization**.

copper-copper sulfate half cell—a commonly used standard reference electrode used to measure the electrical potential between it and the reinforcing steel.

core—a cylindrical sample of hardened concrete or rock obtained by means of a core drill.

core recovery—ratio of the length of core recovered to the length of hole drilled, usually expressed as a percentage.

coring—the process of drilling and extracting cores from concrete structures or rock foundations.

corrosion—destruction of metal by chemical, electrochemical, and electrolytic reaction within its environment.

corrosion inhibitor, surface applied—a chemical compound that, when used as a topical application to hardened concrete in the proper concentration and form, prevents or reduces corrosion.

corrosion threshold—the chloride ion concentration, in the vicinity of the reinforcing steel, sufficient to initiate active corrosion. There is conflicting data on threshold values; however, an acid-soluble chloride threshold value of 1.0 to 1.5 lb/yd³ of concrete is typically used in the United States.

coupler—see **splice, coupler**.

coupling—the means for transmittal of prestressing force from one partial-length tendon to another.

cover—(1) in reinforced concrete, the least distance between the surface of the reinforcement and the outer surface of the concrete. (2) in grouting, the thickness of rock and soil material overlying the stage of the hole being grouted.

coverage—the area that a specified volume of coating will cover to a specified dry thickness.

covermeter—a nondestructive testing instrument for locating embedded steel reinforcement, measuring depth of cover, and estimating the diameter of reinforcement by measuring the change in a low frequency alternating magnetic field applied on the surface of a member.

crack—a complete or incomplete separation of concrete into two or more parts produced by breaking or fracturing.

crack, active—any crack for which the mechanism causing the cracking is still at work; any crack that is still moving.

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crack, dormant—any crack not likely to become active in the future or whose movement is of such magnitude that a repair will not be affected.

crack, hairline—concrete surface crack with a width similar to the diameter of human hair (about 0.10 mm (0.004 in.)). Such cracks are difficult to observe unless the concrete surface is wetted and allowed to dry.

crack, longitudinal—crack that generally parallels the length of a member.

crack, nonstructural—crack that is not the result of external forces and has no effect on structural resistance or integrity; usually the result of shrinkage (plastic, settlement and drying), thermal changes, or internal chemical reaction.

crack, shrinkage—crack caused by restrained shrinkage.

crack, structural—crack that is caused by dead loads, applied forces or other external forces.

crack, thermal—crack caused by internally or externally restrained thermal expansion or contraction.

crack, transverse—crack generally perpendicular to the length of a member.

crack bridging—the ability of repair or protective surface treatment to remain continuous when installed on a cracked concrete surface.

crack injection—a method for sealing or repairing cracks by injecting a polymer or other material.

crack monitor—a device that measures the movement of cracks.

cracking—

cracking, D-cracking—a series of cracks in concrete near and roughly parallel to joints, edges, and structural cracks.

cracking, map—(1) intersecting cracks that extend below the surface of hardened concrete; caused by shrinkage of the drying surface concrete that is restrained by concrete at greater depths where either little or no shrinkage occurs; vary in width from fine and barely visible to open and well-defined; or (2) the chief symptom of chemical reaction between alkalies in cement and mineral constituents in aggregate within hardened concrete; due to differential rate of volume change in different portions of the concrete; cracking is usually random and on a fairly large scale, and in severe instances the cracks may reach a width of 0.50 in. (12.7 mm); also known as pattern cracking. (See also **cracks, checking; and crazing.**)

cracking, pattern—see **cracking, map.**

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cracking, plastic—cracking that occurs in the surface of a fresh cementitious material soon after it is placed and while it is still plastic.

cracking, reflective—the occurrence of cracks in overlays and toppings that coincide with the location of previously existing active cracks in the substrate.

cracking, shrinkage—cracking of a structure or member due to restrained shrinkage caused by a reduction in moisture content, carbonation, or both.

cracking, stress-corrosion—a cracking process that requires the simultaneous action of a corrodent and sustained tensile stress.

cracking, temperature—cracking which occurs when strains, induced by restrained contraction because of decreases in temperature, exceed the tensile strain capacity of a material.

cracks—

cracks, alligator—surface cracking that forms a pattern similar to alligator hide.

cracks, checking—shallow, closely spaced cracks that form an irregular pattern. (See also **cracks, craze**; and **crazing**.)

cracks, craze—fine random cracks or fissures in a surface.

craze cracks—see **cracks, craze**.

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

creep—time-dependent deformation resulting from a sustained load.

creep, compressive—creep that occurs because of compressive load.

creep, drying—creep caused by drying.

creep, tensile—creep that occurs because of tensile load.

critical saturation—see **saturation, critical**.

crosshole logging—a nondestructive testing method for locating low-quality concrete with transducers positioned along the length of holes drilled into a deep foundation. (See also **ultrasonic pulse velocity**.)

cross-linking—the chemical bonding between linear polymer chains to form a three-dimensional network, generally by covalent bonding.

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crystallization—arrangement of previously disordered material segments of repeating patterns into geometric symmetry.

cure—the process by which a compound attains its intended performance properties by means of evaporation, chemical reaction, heat, radiation, or combinations thereof.

cure time—the time interval between formation or placement of a material and the materials' reaching specified design properties; some materials require specified treatment during this interval.

curing—the maintenance of a favorable temperature and moisture environment for repair and protection materials during some definite period following placing, casting, or finishing so that the desired properties may develop.

curing, membrane—a process that involves either liquid sealing compound or nonliquid protective coating, both of which function as films to restrict evaporation of mixing water from cementitious repair materials.

curing, moist—continuous or frequent application of water through ponding, fogging, steam, or saturated cover materials, such as burlap or cotton mats, and the minimization of water loss by use of plastic sheets or other moisture-retaining materials applied over newly placed concrete to promote cement hydration.

curling—the distortion of an originally essentially linear or planar member into a curved shape such as the warping of a slab due to creep or to differences in temperature or moisture content in the zones adjacent to its opposite faces. (See also **warping**.)

curtain grouting—see **grouting, curtain**.

curtain wall—a building facade made of glass and metal.

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

—D—

damp—either moderate absorption or moderate covering of moisture; implies less moisture than a wet condition and slightly more moisture than a moist condition.

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 pre-formed film such as polyethylene sheets placed on grade before placing a slab. (See also **vapor barrier**.)

D-cracking—see **cracking, D-cracking**.

dead load—a constant load that in structures is due to the mass of the members, the supported structure, and permanent attachments or accessories.

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debond—a separation of bonded surfaces.

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

deformation—a change in shape or size.

deformation, time-dependent—deformation caused by time-dependent factors such as autogenous volume change, thermal contraction or expansion, creep, shrinkage, and swelling.

degradation—a detrimental change in the physical and/or chemical properties of a material.

delamination—a separation along a plane parallel to a surface as in the separation of a coating from a substrate or the layers of a coating from each other, or in the case of a concrete slab, a horizontal splitting, cracking, or separation of a slab in a plane roughly parallel to, and generally near, the upper surface.

delivery equipment—equipment which introduces shotcrete material into the delivery hose.

delivery hose—hose used to place shotcrete, grout, or pumped concrete or mortar; also known as a **conveying hose** or **material hose**.

design criteria—Code, Standards, loads, displacement limits, materials, connections, details, and protections used in the design of mandated and voluntary work.

detsensioning—process for controlled release of forces in an unbonded post-tensioned tendon.

deterioration—physical manifestation of failure of a material (e.g., cracking, delamination, flaking, pitting, scaling, spalling, staining) caused by service conditions or internal autogenous influences. (See also **disintegration** and **weathering**.)

dew point—the temperature of a surface at a given ambient temperature and relative humidity, at which condensation of moisture will occur.

dewatering—the removal and control of subsurface groundwater from soil or rock formations. (See also **unwatering**.)

diagonal crack—an inclined or slanted crack that is nonparallel to the transverse or longitudinal axis of a member.

diamond wire cutting—a method for removal of concrete sections with a wire that contains modules impregnated with diamonds; the wire is wrapped around the concrete mass to be cut and connected to a power pack so that it travels in a continuous loop.

differential settlement—a relative variation in rate and/or magnitude of settlement in different areas of a structure.

dimensional compatibility—see **compatibility, dimensional**.

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direct shear test—a shear test in which a material under an applied normal load is stressed to failure by moving one section of the specimen relative to the other section in direction perpendicular to the applied normal load.

discoloration—fading or other alteration of a color that changes the normal appearance.

disintegration—reduction of a mass to components, fragments, or particles. (See also **deterioration** and **weathering**.)

dispenser, coaxial—two-component devices that contain parallel or concentric dispensing cartridges; plungers for each cartridge are depressed simultaneously to extrude the adhesive components in the proper proportions, usually through a static mixing tube.

dispersing agent—a material capable of increasing the fluidity of cement paste, mortars, or concrete by reduction of interparticle attraction.

displacement grouting—see **grouting, displacement**.

distortion—see **deformation**.

distress—physical manifestation of cracking and distortion in a structure as the result of stress, chemical action, or both.

dormant crack—see **crack, dormant**.

dowel—(1) a steel pin, commonly a plain round steel bar, which extends into adjoining portions of a concrete construction, as at a joint in a pavement slab, so as to transfer shear loads; (2) a deformed reinforcing bar intended to transmit tension, compression, or shear through a construction joint.

drain—a pipe or channel used to remove water.

drainage curtain—a row of open holes drilled parallel to and downstream from the grout curtain of a dam for the purpose of reducing uplift pressures.

drainage gallery—an opening or passageway within a concrete structure from which grout holes or drainage holes are drilled. (See also **grout gallery**.)

drilled-in port—pipe nipple for grout hose connection which is embedded in a short entry hole drilled into the concrete surface.

dry-mix shotcrete—see **shotcrete, dry-mix**.

dry pack—very dry portland-cement mortar or polymer-modified mortar usually compacted by ramming.

dry packing—hand placement of very dry mortar and the subsequent tamping or ramming of the mortar into a confined place.

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dry-shake—a dry mixture of hydraulic cement and fine aggregate (either natural or special 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; the mixture either may or may not contain pigment.

drying shrinkage—see **shrinkage, drying**.

duct—formed or cored openings in a concrete member to accommodate a tendon for post-tensioning.

durability—the ability of a structure or its components to maintain serviceability in a given environment over a specified time.

durability factor—a measurement of the ability of a material to retain its properties over a period of time in which it is exposed to deleterious conditions; usually expressed as percentage of the value of a given property before exposure.

dusting—the development of a powdered material at the surface of a cementitious material.

dye tracer—an additive whose primary purpose is to change the color of grout or water.

dynamic modulus of elasticity—the modulus of elasticity computed from the size, weight, shape, and fundamental frequency of vibration of a concrete test specimen, or from pulse velocity.

—E—

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.

efflux time—time required for all grout to escape from a flow cone. (See also **flow cone**.)

elastic modulus—see **modulus of elasticity**.

elasticity—that property of a material that enables it to return to its original size and shape after deformation.

elastomer—a macromolecular material that at room temperature returns rapidly to approximately its initial dimensions and shape after substantial deformation by a weak stress and removal of the stress; a term often used for rubber and polymers that have properties similar to those of rubber.

elastomeric—having the characteristics of an elastomer.

electrical resistivity—a measure of the resistance of a material to flow of electric current.

electric log—a record or log of a borehole obtained by lowering electrodes into the hole and measuring any of the various electrical properties of the materials traversed.

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electrochemical chloride extraction—corrosion passivation by removal of chlorides from concrete as a result of the application of a direct current that causes chlorides to migrate away from the reinforcing steel and out of the concrete.

electrochemical compatibility—see **compatibility, electrochemical**.

electrolysis—production of chemical changes by the passage of current through an electrolyte.

electrolyte—an ionically conducting medium in which the flow of charge is accompanied by movement ions; usually an aqueous solution.

electrolytic cell—a unit apparatus in which electrochemical reactions are produced by applying electrical energy, or that supplies electrical energy as a result of chemical reactions and that includes two or more electrodes and one or more electrolytes contained in a suitable vessel.

elephant trunk—an articulated tube or chute used in concrete placement.

elongation—increase in length.

emulsion—a two-phase liquid system in which one liquid is immiscible in and uniformly dispersed throughout another liquid.

endothermic reaction—a chemical reaction in which heat is absorbed.

Engineer of record—an Engineer that is in responsible charge of the engineering evaluation, design, or other engineering responsibilities of a project.

envelope grouting—see **grouting, envelope**.

epoxy injection—a method for sealing or repairing cracks in concrete by injecting epoxy adhesives.

epoxy mortar—a mixture of epoxy resin, curing agent, and fine aggregate.

epoxy resin—see **resin, epoxy**.

erosion—progressive disintegration of a solid by the abrasive or cavitation action of gases, fluids, or solids in motion. (See also **abrasion damage** and **cavitation damage**.)

ettringite—a mineral, high-sulfate calcium sulphoaluminate, occurring in nature or formed by sulfate attack on mortar or concrete.

ester—a class of compounds formed by the reaction of alcohols and organic acids.

evaluation—the process of assessing the need for maintenance, repair, or rehabilitation of concrete and concrete structures by determining in-situ condition and identifying the cause and extent of distress or deterioration; the process may include field and laboratory testing and engineering calculations. (See also **condition assessment; condition survey; and visual inspection**.)

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evaporable water—see **water, evaporable**. (See also **water, non-evaporable**.)

exfoliation—disintegration by scaling or peeling off in thin flakes; corrosion along planes parallel to the surface that forces metal away from the body of the material resulting in a layered appearance.

exotherm—heat released during a chemical reaction.

exothermic reaction—a chemical reaction in which heat is evolved.

expansion—increase in either length or volume.

expansion anchors—see **anchor, expansion**.

expansive cement—see **cement, expansive**.

extender—a finely divided inert mineral or coarse aggregate added to provide economical bulk in synthetic resins and adhesives or cementitious mortars.

extensibility—the maximum tensile strain that hardened cement paste, mortar, or concrete can sustain without formation of a continuous crack.

extensometer points—an arrangement of three embedded plugs or surface-mounted discs, two on one side of a crack and the third on the other, which, when used in combination with a mechanical strain gage, provides a technique for monitoring crack width.

external strengthening—see **strengthening, external**.

explosive blasting—a method for fracturing and removing concrete with rapidly expanding gas confined within a series of bore holes; a cost effective and expedient means for removing large quantities of concrete.

exudation—a liquid or viscous gel-like material discharged through a pore, crack, or opening in the surface of concrete.

—F—

factor of safety—the ratio of capacity to demand for a structure or structural element.

failure—a point at which a material stops performing as it was intended to.

failure, adhesive—a rupture of an adhesive bond such that the separation appears to be between the adhesive and one or both of the adherends. (See also **failure, cohesive**.)

failure, cohesive—rupture of an adhesive bond such that the separation appears to be within the adhesive.

false set—see **set, false**. (See also **set, flash**.)

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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.

fatigue—the weakening or failure of a material subjected to prolonged or repeated stress.

faulting—a crack or joint in a surface along which there has been relative vertical displacement of the two sides parallel to the discontinuity.

feather edge—to smoothly blend the edge of a repair or topping into the existing concrete at an acute angle.

feed wheel—material distributor or regulator in certain types of shotcrete equipment.

fibers—slender and greatly elongated solid materials, generally with a length at least 100 times its diameter, that has properties making it desirable for use as reinforcement.

fibers, carbon—reinforcing fiber with light-weight, high-strength, and high-stiffness characteristics produced by oxidizing organic polymer fibers.

fibers, glass—reinforcing fiber made by drawing molten glass through bushings; the predominant reinforcement for polymer matrix composites, known for its good strength, process ability, and low cost.

fibers, polyolefin—manufactured fibers in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85% by weight of ethylene, propylene, or other olefin units, except amorphous (noncrystalline) polyolefins.

fibers, polypropylene—highly chemically inert, long-chain synthetic polymer; fibrillated and monofilament fibers for concrete reinforcement.

fibers, steel—small discontinuous fibers for random dispersion within cementitious materials; typical fiber shapes include round, oval, rectangular, and crescent cross sections, depending on the manufacturing process and raw material used.

fibers, synthetic—polymeric fibers, such as polypropylene, polyolefin, nylon, polyethylene, polyester, and acrylic, that can be used in fiber-reinforced cementitious materials and protective coating systems.

fiber mat—a fibrous reinforcing material composed of chopped filaments (for chopped-strand mat) or swirled filaments (for continuous-strand mat) with a binder applied to maintain form; available in blankets of various widths, weights, thicknesses, and lengths.

fiber-reinforced composite—any composite material consisting of a matrix reinforced by continuous or discontinuous 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.

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fibrous concrete—see **concrete, fiber-reinforced**.

field-cured cylinders—test cylinders that are left at the jobsite for curing as nearly as practicable in the same manner as the repair material to indicate when supporting forms may be removed, additional construction loads may be imposed, or the structure may be placed in service.

field-molded sealant—see **sealant, field-molded**.

filaments—individual fibers of indefinite lengths used in tows, yarns, or roving.

filler—a general term for an inert material that occupies space and may improve physical properties or lower cost. (See also **extender**.)

film—a thin coating over the surface of a material.

finish—the texture or appearance of a surface after placement and finishing operations have been performed.

finish, broom—the surface texture obtained by stroking a broom over freshly placed concrete or other material.

finish, coat—the final thin coat of shotcrete applied prior to hand finishing. (See also **flash coat**.)

finish, exposed-aggregate—a decorative finish for concrete achieved by removing, usually before the concrete has fully hardened, the outer skin of mortar and exposing the coarse aggregate.

finish, gun—undisturbed final layer of shotcrete as applied from nozzle, without hand finishing.

finish, trowel—the smooth or textured finish of an unformed concrete surface obtained by troweling.

finishing—leveling, smoothing, consolidating, and otherwise treating the surface of a material to produce the desired appearance.

fissure—a narrow opening, crack, or separation on a concrete surface.

flash coat—a thin coat of shotcrete applied from a distance greater than normal for use as a final coat or for finishing.

flash point—the lowest temperature of a liquid at which sufficient vapor is provided to form an ignitable mixture when combined with air.

flash set—see **set, flash**. (See also **set, false**.)

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flaw detection—detection of internal defects including voids, under-consolidated concrete and cracking.

flexural strength—see **strength, flexural**.

fouling—marine growth such as barnacles adhering to a substrate.

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; or
- (3) movement of uncured resin under gravity loads or differential pressure.

flow cone—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 (flow factor) being used as the indication of consistency; also the mold used to prepare a specimen for the flow test.

flow line—a defect induced by discontinuous flow velocities and lack of proper consolidation during placement of concrete by pumping.

fluidifier—an admixture employed in grout to decrease the flow factor without changing water content. (See also **admixture, water reducing**.)

fly ash—the finely divided residue resulting from the combustion of coal in electric power generating plants.

fly ash, Class C—ash normally produced by burning sub-bituminous coal or lignite; usually has significant cementitious properties in addition to pozzolanic properties, particularly those ashes with CaO contents of 15 to 30%.

fly ash, Class F—ash usually produced by burning anthracite or bituminous coal; ashes generally have CaO contents less than 10% and are rarely cementitious when mixed with water alone.

fog curing—application of atomized fresh water to cementitious repair materials.

form—a temporary structure or mold for the support of a repair while it is curing and gaining sufficient strength to be self-supporting.

form and pour—the placement of a repair material through gravity flow into an enclosed space with formwork defining exposed boundaries.

form and pump—the placement of repair material using mechanical pumping equipment into an enclosed space with formwork defining exposed boundaries.

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form lining—materials used to line the interior face of formwork in order to impart a smooth or patterned finish to the repair surface, to absorb moisture from the repair material, or to apply a set-retarding chemical to the formed surface.

form scabbing—inadvertent removal of the surface of a repair material because it had adhered to the form.

fracture—a crack or break, as of concrete, or a rock mass; the configuration of a broken surface; also the action of cracking or breaking. (See also **crack**.)

friction—force that resists the relative motion of two surfaces in contact.

full-depth repair—see **repair, full depth**.

fungicide—a substance poisonous to fungi used to retard or kill mold and mildew growth.

furan resin—see **resin, furan**.

fuzzy—a hairy surface appearance caused by protruding broken fibers or filaments.

—G—

gage length—the original length of that portion of a specimen or structure over which a deformation measurement is made.

galvanic corrosion—accelerated corrosion of a metal because of an electrical contact with a more noble metal or a more noble nonmetallic conductor in a corrosive electrolyte.

gel—(1) matter in a colloidal state that does not dissolve, but remains suspended in a solvent from which it fails to precipitate without the intervention of heat or of an electrolyte. (2) the condition where a liquid grout begins to exhibit measurable shear strength.

gel time—the time interval between mixing the constituents of a liquid material and the formation of a gel.

geomembrane—a flexible, watertight polymeric membrane with a thickness of one-half to a few millimeters; a wide range of polymers, including plastics, elastomers and blends of polymers are used to manufacture geomembranes.

geonet—a geosynthetic consisting of integrally connected parallel sets of ribs overlying similar sets at various angles for planar drainage of liquids and gases.

glass fibers—see **fibers, glass**.

glass-fiber reinforced cement—a composite material consisting essentially of a matrix of hydraulic cement paste or mortar reinforced with glass fibers; typically precast into units less than 1-in. (25-mm) thick.

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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.

global stability—the stability of the overall structure with respect to uplift, overturning, sway instability or sliding failure; global stability failures result in the collapse of a structure.

go-devil—a ball of rolled-up burlap or paper or a specially fabricated device put into the pump end of a pipeline or tremie pipe immediately prior to introduction of the concrete and forced through the pipe to keep the concrete from mixing with water in the pipe as the concrete flows to the bottom of the pipe; also used to clean pipelines and tremie pipes.

gravity feed—the movement of materials from one container to another container or location by force of gravity.

gravity grouting—see **grouting, gravity**

gravity soak—method for repair of cracks in horizontal concrete sections by topical application of a low viscosity resin.

grinding—the removal of thin coatings, mineral deposits, or slight protrusions on a concrete surface with rotating abrasive stones or discs under pressure at right angles to the surface.

grit blasting—abrasive blasting with small irregular pieces of steel or malleable cast iron.

groove joint—see **joint, contraction** (preferred term).

grooving—a process in which narrow parallel channels are cut into the surface of a material to improve drainage and skid resistance of surfaces subjected to traffic.

ground penetrating radar—see **short-pulse radar**.

ground wire—small-gage high-strength steel wire used to establish line and grade as in shotcrete work; also called **alignment wire** and **screed wire**.

grout—a fluid mixture of cementitious or polymer materials used as a filler for cracks or other voids in concrete or foundations such as soil or rock.

grout, cementitious—a mixture of cementitious material and water, with or without aggregate, proportioned to produce a pourable consistency without segregation of the constituents.

grout, chemical—any materials, including sodium silicate, acrylate, lignin, urethane, and resin characterized by being a true solution; no particles in suspension. (See also **grout, particulate**.)

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

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grout, compaction—injection grout with less than 1 in. (25 mm) slump; normally a soil-cement with sufficient silt sizes to provide plasticity and sufficient sand sizes to develop internal friction; generally does not enter soil pores but remains in a homogenous mass that provides controlled displacement to compact loose soils or lift structures, or both.

grout, exothermic—grout that produces heat when the binder and catalyst react; peak exothermic reaction temperature occurs when the grout changes from a liquid to a solid.

grout, neat cement—a mixture of hydraulic cement and water.

grout, organic—grouts that gel or set by chemical reaction. (See also **grout, chemical**)

grout, particulate—any grouting material characterized by undissolved (insoluble) particles in the mix. (See also **grout, chemical**.)

grout, sanded—a grout mixture that contains fine aggregates.

grout, sodium silicate—a commonly used chemical grout system based on reacting a silicate solution to form a gel that binds soil or sediment particles and fills voids.

grout, water-activated—a class of injection grouts that react with water to form polyurethane polymers.

groutability—the ability of a formation to accept grout.

grout cap—a cap that is formed by placing concrete along the top of a grout curtain; often used in weak foundation rock to secure grout nipples, control leakage, and form an impermeable barrier at the top of a grout curtain.

grout gallery—an opening within a dam used for grouting or drainage operations.

grout header—a pipe assembly attached to a ground hole, and to which lines for injecting grout are attached; sometimes called a grout manifold.

grout injection—the process of pumping grout under pressure to fill cracks, and voids.

grout mixture—the proportions or amounts of the various materials used in the grout, expressed by weight or by volume.

grout nipple—a short length of pipe installed at the collar of the grout hole to facilitate grout injection.

grout penetrability—a grout property descriptive of its ability to fill a porous mass; primarily a function of lubricity and viscosity.

grout slope—the natural slope of fluid grout injected into preplaced-aggregate concrete.

grout system—combination of materials used in a specified grout mixture.

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grout take—the measured quantity of grout injected into a unit volume of formation, or a unit length of grout hole.

grouting—the process of injecting, filling, or displacing a volume with grout.

grouting, advancing-slope—a grout injection technique that causes the leading edge of a mass of grout to move horizontally through preplaced aggregate.

grouting, backpack—filling the annular space between a permanent tunnel lining and the surrounding formation with grout.

grouting, blanket—a method for reducing the permeability and strengthening the upper layers of bedrock by drilling and grouting shallow, closely spaced holes according to a grid pattern.

grouting, circuit—a grouting method by which grout is circulated through a pipe extending to the bottom of the hole and back up the hole via the annular space outside the pipe, the excess grout being diverted back over a screen to the agitator tank by means of a packing gland at the top of the hole; used where holes tend to cave and sloughing material might otherwise clog openings to be grouted.

grouting, curtain—subsurface injection of grout to create a barrier of grouted material transverse to the direction of anticipated water flow.

grouting, displacement—injection of grout in such a manner as to physically move material adjacent to the point of grout injection. (See also **grouting, penetration**.)

grouting, envelope—grouting of rock surrounding a hydraulic pressure tunnel to consolidate the rock and reduce permeability of the area.

grouting, gravity—grouting by using only the height of the fluid column to provide pressure.

grouting, injection—a method for sealing or repairing cracks in concrete and filling voids within a concrete structure or foundation.

grouting, jet—technique utilizing a special drill bit with horizontal and vertical high-speed water jets to excavate alluvial soils and produce hard, impervious columns by pumping grout through the horizontal nozzles that jets and mixes with foundation material as the drill bit is withdrawn.

grouting, open-circuit—a grouting system with no provision for recirculation of grout to the pump.

grouting, penetration—filling joints or fractures in rock or pore spaces in soil with a grout without disturbing the formation; this grouting method does not modify the solid formation structure. (See also **grouting, displacement**.)

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grouting, perimeter—injection of grout, usually at relatively low pressure, around the periphery of an area which is subsequently to be grouted at greater pressure; intended to confine subsequent grout injection within the perimeter.

grouting, permeation—filling joints or fractures in rock or pore spaces in soil with a grout, without disturbing the formation.

grouting, series—similar to stage grouting, except each successively deeper zone is grouted by means of a newly drilled hole, eliminating the need for washing grout out before drilling the hole deeper.

grouting, slush—application of cement slurry to surface rock as a means of filling cracks and surface irregularities or to prevent slaking; also applied to riprap to form grouted riprap.

grouting, stage—sequential grouting of a hole in separate steps or stages in lieu of grouting the entire length at once; holes may be grouted in ascending stages by using packers or in descending stages downward from the collar of the hole.

guideline—a written statement of policy or procedure.

gun—delivery equipment that pneumatically places shotcrete and freshly mixed concrete.

gun casting—a procedure in which concrete or mortar is placed with a special velocity-reducing casting head and standard shotcrete delivery equipment.

gun finish—see **finish, gun**.

Gunite—a proprietary term for shotcrete.

gunman—workman on shotcreting crew who operates delivery equipment.

gunning—pneumatically projecting shotcrete onto surface to be gunned.

gunned pattern—(1) conical outline of material discharge stream in shotcrete operation; (2) the sequence of gunning operations to insure complete filling of the space, total encasement of reinforcing bars, easy removal of rebound, and thickness of shotcrete layers.

—H—

hairline crack—see **crack, hairline**.

halo effect—see **anodic ring effect**.

half-cell potential—a nondestructive testing method for identifying regions in a reinforced concrete structure where there is a high probability that corrosion is occurring at the time of test by measuring the potential difference (voltage) between the steel reinforcement and a standard reference electrode; a copper-copper sulfate half cell is commonly used on bridge decks.

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Hamm tip—flared shotcrete nozzle having a larger diameter at midpoint than at either inlet or outlet; also designated premixing tip.

hand-held breakers—see **concrete breakers, hand-held**.

hand lance—hand-held wand or tool used to direct a water jet during water blasting; lance may have single water jet or multiple water jets mounted on a rotating head.

hardener—in a two-component adhesive or coating, the chemical component that causes the resin component to cure.

hardness—the resistance of a material to deformation, particularly permanent deformation, indentation, or scratching.

hazardous substance—any substance that can harm people, other living organisms, property, or the environment.

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.

heat of hydration—heat evolved during the setting and hardening of portland cement.

heat of solution—heat emitted or absorbed by a substance being dissolved in a solvent.

high-build coating—see **coating, high-build**.

high-molecular weight methacrylate—a low-viscosity substituted methacrylate monomer that is characterized by low volatility.

high-pressure water blasting—a process for cleaning, or roughening with a stream of water under high pressure that contains an abrasive such as sand, aluminum oxide, or garnet.

high-pressure water jets—water jets with a force capable of selectively cutting through deteriorated concrete; widely used as a surface preparation method in concrete repair.

high-range water reducer—see **admixture, water reducing (high-range)**.

holiday—a discontinuity in a coating material that exposes the substrate.

hollow-core bit—carbide-tipped drills with internal ports for water flushing or vacuum extraction of cuttings during drilling; used in drilling deep injection ports to minimize plugging of internal cracks intersected by drill hole.

homogenous material—a material that exhibits essentially the same physical properties throughout the material.

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honeycomb—voids in concrete created when the mortar does not fill all the spaces among coarse aggregate particles.

hybrid composite—a composite made with two or more types of reinforcing fibers.

hydration—combining water with another substance to create a compound; in concrete, the chemical reaction between hydraulic cement and water.

hydraulic splitting—a method for removal of concrete by means of hydraulic forces that split concrete into smaller masses.

hydro nozzle—a special prewetting and mixing nozzle consisting of a short length of delivery hose inserted between the nozzle body and nozzle tip.

hydrodemolition—a method for removal of concrete by means of water under high pressure directed against a surface; provides a sound concrete substrate and cleans steel reinforcement for reuse.

hydrogen embrittlement—cracking or loss of ductility caused by hydrogen in a metal.

hydrophilic—material which exhibits a strong affinity for water; wettable.

hydrophobic—material which does not exhibit affinity for water; tends to repel water.

hydrostatic head—the fluid pressure of a liquid produced by the height of that liquid above a given point.

hygrometer—an instrument used to measure humidity.

hygroscopic—material that readily absorbs and retains moisture from the air.

—|—

impact—instantaneous contact of a moving body with another body, either moving or at rest.

impact breakers—see **concrete breakers, impact**.

impact echo—a nondestructive testing method, based on stress wave propagation, that uses impact to generate a low frequency wave; the presence and position of a reflector, such as a crack, delamination, or void, are indicated by the echo amplitude and time.

impact resistance—resistance to fracture under the sudden application of an external force.

impending slough—a consistency of a shotcrete mixture containing the maximum amount of water such that the product will not flow or sag after placement.

impregnation—a process in which the void structure of a hardened material is filled by saturation with a liquid.

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impulse radar—a nondestructive testing procedure that uses low-power impulse radar elements and advanced signal processing techniques to detect and image the internal structure of reinforced concrete.

incompatible—a condition in which two or more materials are unable to combine or remain together without undesirable aftereffects. (See also **compatibility**.)

incrustation—a crust or coating, generally hard, formed on the surface of hardened concrete.

induction time—the time between mixing of two-component materials and the time they can be used.

inert—devoid of active properties; incapable of or resisting combination.

infiltration—the uncontrolled ingress of air or liquid through cracks and pores in concrete.

infrared thermography—a nondestructive testing method for locating delaminations in pavements and bridge decks and detecting moist insulation in buildings; the presence of flaws within concrete affects the heat conduction properties of the concrete and the presence of defects is indicated by differences in surface temperatures when the test object is exposed to correct ambient conditions.

inhibitor—a substance that slows chemical reaction.

initiator—a substance capable of causing a chemical reaction (such as polymerization or curing) to start.

injection grouting—see **grouting, injection**.

injection port—entry point where grout is introduced into cracks and voids.

in-situ—situated in the original place or position; undisturbed.

in-situ condition—the existing condition of a structure, member, connection, or components including sizes and geometry, material properties, and damage from aging or other events.

interface—the common boundary surface between two materials, e.g., an existing concrete substrate and a bonded repair material.

intumescent coating—a fire retardant coating which, when heated, produces nonflammable gases that convert the coating to a foam, thereby insulating the substrate.

investigation—collecting and assembling data and detailed information regarding a structure's behavior, condition, and strength, acquired from analyses of documents, surveys, observations and tests, and other means, such as conducting interviews with persons knowledgeable of the structure.

isotropic material—a material that exhibits the same properties in all directions.

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—J—

jacket—an integral covering which is applied over an existing structural element, e.g. a concrete pile, whose primary function is to strengthen or provide environmental protection, or both.

jackhammer—hand-held mechanical breaker for removal of concrete.

jaw crusher—boom-mounted mechanical crusher for removal of concrete from decks, walls, columns, and other concrete members where the shearing plane depth is 6 ft (1.8 m) or less; pulverizing jaw attachment can debond concrete from steel reinforcement for recycling purposes. (See also **mechanical shearing**.)

joint—a physical separation in concrete, including cracks if intentionally made to occur at specified locations.

joint, articulated—a joint with movement limited by restraint.

joint, cold—an unplanned joint or discontinuity resulting from a delay in placement of sufficient time to preclude a union of the material in two successive lifts.

joint, construction—interface between two successive placements; bond is typically required at such joints and reinforcement may be continuous.

joint, contraction—formed, sawed, or tooled groove in a repair surface to create a weakened plane and regulate the location of cracking resulting from restrained dimensional change.

joint, control—see **joint, contraction** (preferred term.)

joint, expansion—(1) a separation provided between adjoining parts of a structure to allow expansion and contraction; (2) a separation between pavement slabs on grade, filled with a compressible filler material.

joint, groove—see **joint, contraction** (preferred term).

joint, isolation—a separation between adjoining parts of a structure that allows relative movement in three directions; usually vertical planes located to avoid formation of cracks in the structure. (See also **joint, contraction** and **joint, expansion**.)

joint, longitudinal—a joint parallel to the length of a structure or pavement.

joint, sawed—a joint cut in hardened concrete, generally not to the full depth of the member, by means of special equipment.

joint, transverse—a joint normal to the longitudinal dimension of a structural element, assembly of elements, slab, or structure.

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joint filler—compressible material used to fill a joint to prevent the infiltration of debris and to provide support for sealants.

joint sealant—see **sealant, joint**.

joint spall—a fragment detached from a concrete mass adjacent to a joint.

jumbo—a specially built mobile carrier used to provide a work platform for tunneling operations, such as installing rock bolts and grouting.

jurisdictional authority—person or entity that has legal control over the applicable building code and permitting procedures for a structure; examples of jurisdictional authorities include local building officials.

—K—

kerf—a saw cut in a concrete surface for embedment of the perimeter of a membrane or other thin surface treatment.

keyway—a recess or groove in a concrete substrate which is filled with repair material to provide increased shear strength along the interface.

—L—

laitance—a weak layer of cement and aggregate fines on a concrete surface that is usually caused by an overwet mixture, overworking the mixture or excessive finishing, underwater concrete placement, or combinations thereof.

lamine—to bond layers of a material.

lance—equipment for shooting refractory shotcrete material into areas that have a high temperature; typically, a length of metal pipe with an extended nozzle with various configurations.

latex—a stable emulsion of natural or synthetic rubber in water.

latex-modified concrete—see **concrete, polymer-modified**.

leakage—the quantity of material that accidentally enters or escapes through an opening such as a hole or crack.

length change—increase or decrease in length. (See also **volume change** and **deformation**.)

licensed professional engineer (“Engineer”)—person that is registered in the jurisdiction where the project is located and based upon licensure, professional experience, and academic education or training can apply scientific and mathematical principles toward the structure assessment and design of existing structures.

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lift—individual layer of repair material where several layers or courses are required to achieve the total depth of a repair.

lift-off test—a procedure that uses a calibrated hydraulic ram system to assess the effective force in an unbonded post-tensioned tendon or to detension existing tendons.

lifting—softening and raising or wrinkling of a pervious coat by the application of an additional coat; often caused by coatings containing strong solvents.

linear polarization—a nondestructive testing method to estimate the instantaneous corrosion rate of the concrete reinforcement located below the test point by measuring the current required to change by a fixed amount the potential difference between the reinforcement and a standard reference electrode.

lining—any protective material applied to the interior surface of a conduit, pipe, or tunnel to provide watertightness, erosion resistance, chemical resistance, or reduced friction.

liquid-volume measurement—measurement of grout on the basis of the total volume of solid and liquid constituents.

live load—a moving load on a structure.

load cell—device for measuring the magnitude of an applied load.

load factor—a factor by which a service load is multiplied to determine a factored load used in the strength-design method.

load test—procedure consisting of applying loads to verify the strength and behavior of a structure or structural member.

lock-off—device that maintains tension on a monostrand tendon while the end anchorage is replaced.

longitudinal crack—see **crack, longitudinal**.

lot—a definite quantity of a product or material accumulated under conditions that are considered uniform for sampling purposes.

low-pressure spray-applied mortar—the placement of a repair material by spraying using a low-velocity pump with air added at the nozzle.

lubricity—in grouting, the physico-chemical characteristic of a grout material flow through a soil or rock that is the inverse of the inherent friction of that material to the soil or rock; comparable to “wetness.”

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—M—

macrocell corrosion—process whereby one layer of metallic reinforcement corrodes preferentially to another layer. (See also **microcell corrosion**.)

macrofiber—a fiber with an equivalent diameter equal to or greater than 0.012 in. (0.3 mm) for use in concrete.

magnesium phosphate cement—see **cement, magnesium phosphate**.

maintenance—taking periodic actions that will delay damage or deterioration or both. (See also **preservation** and **protection**.)

manifold—see **grout header**.

map cracking—see **cracking, map**.

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, bonded hollow-wall—a cavity wall, built of masonry units, in which the inner and outer walls are tied together by bonders (masonry units placed perpendicular to the plane of the wall that act as ties).

masonry, grouted—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.

masonry, hollow-unit—masonry consisting either entirely or partially of hollow masonry units laid in mortar.

masonry, reinforced—unit masonry in which reinforcement is embedded in such a manner that the two materials act together in resisting forces.

masonry, solid-unit—masonry consisting wholly of solid masonry units laid in mortar.

masonry structure—a structure of individual masonry units laid in and bonded together with mortar.

mastic—a thick adhesive material used to hold waterproofing membranes in place or as a sealant.

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; or

(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 reinforcing for a fiber reinforced polymer composite material.

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match—to provide, by selection, formulation, adjustment, or other means, a surface repair that is indistinguishable from or within specified tolerances of the surrounding area.

material hose—see **delivery hose**.

matrix—(1) in the case of mortar, the cement paste in which the fine aggregate particles are embedded; in the case of concrete, the mortar in which coarse aggregate particles are embedded; (2) in the case of fiber-reinforced composites, the resin or binders in which the fiber reinforcements are embedded.

mechanical anchors—see **expansion anchors**.

mechanical bond—in general concrete construction, the physical interlock between cement paste and aggregate, or between concrete and reinforcement (specifically, the sliding resistance of an embedded bar and not the adhesive resistance).

mechanical properties—those properties of a material that are associated with elastic and inelastic reaction when force is applied, or which involve the relationship between stress and strain.

mechanical shearing—a method for removal of concrete and steel with hydraulically powered jaws; especially applicable for demolition work. (See also **jaw crusher**.)

membrane—protective surface treatment with a thickness greater than 30 mils (0.75 mm) and less than 250 mils (6 mm) applied to the surface of concrete.

membrane, liquid—a liquid material applied to a surface to form a continuous waterproof film after it cures.

membrane, sheet—any functionally continuous flexible structure of felt, fabric, or mat, or combinations thereof, and plying cement.

membrane curing—see **curing, membrane**.

metering pump—a device incorporating one or more pumps for pressurizing and delivering fluids such as grout; for multi-component materials, the flow rates of the pumps are synchronized to dispense the components at the desired ratio.

methacrylate—see **resin, methacrylate**.

methods of measurement—the definition of how repair areas will be quantified for billing purposes during performance of work, e.g., per linear foot, per square foot, per cubic foot, etc.

methyl methacrylate—a colorless, volatile liquid derived from acetone cyanohydrin, methanol, and dilute sulfuric acid.

microcell corrosion—localized corrosion in which anodic and cathodic reaction sites are in close proximity to one another. (See also **macrocell corrosion**.)

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microcracks—cracks too small to be seen with the unaided eye.

microsilica—see **silica fume**.

mil—one thousandth of an inch, 0.001 in. (0.0254 mm); typically used as the unit of measurement for thickness of thin coatings.

mildew—a superficial growth produced by fungi in the presence of moisture that causes surface discoloration and decomposition.

milling—method commonly used for removal of a specified depth of concrete from large areas of horizontal or vertical surfaces. (See also **scarifier**.)

mineral filler—a finely divided mineral product at least 65% of which passes the U. S. Standard 75- μ m (No. 200) sieve.

minimum-film-forming temperature—the lowest temperature at which latex will coalesce to form a continuous film.

mist—a process in which a very fine spray of water is applied to, (a) a fresh concrete surface to minimize the potential for plastic shrinkage cracking, or (b) a hardened concrete surface for moist curing.

mix—to combine or blend two or more materials into a single mixture; a compound of two or more materials.

mixer—a machine used for blending the constituents of concrete, grout, mortar, cement paste, or other mixtures.

mixing speed—rotation rate of a mixer drum or of the paddles in an open-top, pan, or trough mixer, when mixing a batch.

mixing time—the time from completion of mixer charging until the beginning of discharge.

mixture—the assembled, blended, commingled ingredients of mortar, concrete, or the like; or the proportions for their assembly.

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

modulus of rupture—a measure of the ultimate load-carrying capacity of a beam tested in flexure. (See also **strength, flexural**.)

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moisture—

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

moisture, free—moisture having essentially the properties of pure water in bulk; moisture not absorbed by aggregate. (See also **moisture, surface**.)

moisture, surface—free water retained on surfaces of aggregate particles and considered to be part of the mixing water in concrete, as distinguished from absorbed moisture.

moisture content—the ratio, expressed as a percentage, of the mass of absorbed or adsorbed water in a given material to the total mass.

moisture movement—the movement of moisture through a porous medium. (See also **shrinkage** and **swelling**.)

moisture vapor transmission rate—see **water vapor transmission rate**.

monolithic—a system wherein the individual components react together as a uniform, continuous mass.

monomer—an organic liquid, of relatively low molecular weight, that creates a solid polymer by reacting with itself or other compounds of low molecular weight or both.

mortar—a mixture of cement paste and fine aggregate.

mortar, polymer—a composite material of fine aggregates bound together by an organic polymer.

mottled—adjacent spots of different tones and colors in a coating film that create a blotchy effect.

mudcracking—a coating defect characterized by a broken network of cracks in the surface film.

mudjacking—see **slabjacking**.

—N—

natural frequency—the frequency at which a system that has been moved from its resting position will oscillate about the position if there are no disturbing forces.

neat cement grout—see **grout, neat cement**.

neat cement paste—see **paste, neat cement**.

necking—the change in cross-sectional area of a material as it elongates.

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needle scaling—a surface preparation method in which the surface is impacted with the pointed tips of a bundle of steel rods contained by a steel tube and pulsed by compressed air.

negative side waterproofing—applying waterproofing to the side of a structural element opposite the one subjected to hydrostatic pressure.

neoprene—an elastomer, polychloroprene, formed by adding hydrogen chloride to monovinylacetylene.

nondestructive testing (NDT)—examination of materials and structures in ways that do not impair future usefulness and serviceability in order to detect, locate, and measure discontinuities, defects, and other imperfections to assess integrity, properties, and uniformity, and to measure geometrical characteristics.

nondestructive evaluation (NDE)—condition evaluation conducted with nondestructive methods.

non-evaporable water—the water that is chemically combined during cement hydration; not removable by specified drying. (See also **evaporable water**.)

nozzle—an open-ended metal or rubber tip attached to the discharge end of a shotcrete nozzle body.

nozzle body—a device at the end of a shotcrete delivery hose that contains a regulating valve and a manifold for adding water or air to the shotcrete mixture.

nozzle liner—a rubber lining placed inside the nozzle tip to provide abrasion protection.

nozzle operator—the technician who manipulates the nozzle and controls placement of the shotcrete; in the case of dry-mix shotcrete, the technician also controls the water content of the shotcrete.

nozzle velocity—the velocity (speed) at which shotcrete is ejected from the nozzle.



opacity—the ability of a surface-applied coating to obliterate or hide the color of the surface to which it is applied.

open-circuit grouting—see **grouting, open-circuit**.

orange peel—the dimpled appearance of a dried surface-applied coating that resembles the peel of an orange.

osmosis—spontaneous flow of water from a less concentrated solution to a more concentrated solution through a semipermeable membrane until chemical potential equilibrium is achieved.; the tendency of fluids to diffuse in such a manner.

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osmotic pressure—the pressure required to maintain an equilibrium, with no net movement of fluid through a semipermeable membrane.

outgassing—the upward and outward emission of air or moisture vapor from concrete or mortar.

overbreak—the quantity of material that is excavated or breaks out beyond the perimeter of a specific removal area.

overlay—a bonded or unbonded layer of material placed on a concrete surface to either restore or improve the function of the previous surface.

overlay, bonded—increase in section of an existing concrete element by addition of a layer of material in direct contact with and adhering to the existing concrete surface.

overlay, unbonded—increase in section of an existing concrete element by addition of a layer of material placed on a separator layer (bond breaker) designed to prevent bonding to the existing concrete.

overspray—(1) in protective coatings, any material not deposited within the surface area specified for coating. (2) in shotcreting, material deposited away from the intended receiving surface.

Owner—the corporation, association, partnerships, individual, or public body or authority with whom Contractor enters into an agreement and for whom the work is provided.

oxidize—to unite with oxygen; cause the oxidation of; rust.

—P—

pachometer—nondestructive testing device commonly used to detect and locate embedded reinforcing steel; the device emits an electromagnetic field and detects disturbances in the field caused by embedded metals.

packer—an expandable device inserted into a hole to be grouted that prevents the grout from flowing back around the injection pipe.

paddle mixer—a mixer consisting essentially of a trough within which mixing paddles revolve about the horizontal axis, or a pan within which mixing blades revolve about the vertical axis.

pargeting—to cover with plaster.

partial-depth repair—see **repair, partial-depth**.

particle size—the controlling lineal dimension of individual particles.

particulate grout—see **grout, particulate**.

pass—one movement over an area; a layer of material placed in one movement over an area.

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passivating layer—thin and tightly adhered oxide film on a metal surface that protects a metal against active corrosion.

pattern cracks—see **cracks, craze** and **cracking, map**.

pea gravel—screened gravel, most of the particles of which pass a 3/8 in. sieve (9.5 mm) and are retained on a No. 4 sieve (4.75 mm).

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.

penetration grouting—see **grouting, penetration**.

penetration probe—a device for obtaining a measure of 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.

penetrating sealer—material that has the ability to penetrate and seal the surface to which it is applied. (See also **sealing compound**.)

percussion drilling—a drilling process in which a hole is advanced by using a series of impacts to the drill steel and attached bit; the bit is normally rotated during drilling. (See also **rotary drilling**.)

performance monitoring—monitoring of the performance of a structure, typically through nondestructive methods and/or instrumentation with the objective of identifying or monitoring progressing distress or deterioration.

perimeter grouting—see **grouting, perimeter**.

perm—the mass rate of water vapor flow through one square foot of a material or construction of one grain per hour induced by a vapor pressure gradient between two surfaces of one inch of mercury or in units that equal that flow rate.

permanent set—see **set, permanent**.

permeability—the property of porous material that permits a fluid (or gas) to pass through it; in construction, commonly refers to water vapor permeability of a sheet material or assembly and is defined as water vapor permeance per unit thickness. (See also **water vapor transmission; perm; and permeance**.)

permeability to water, coefficient of—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 68 °F (20 °C).

permeance (water vapor)—the ratio of the rate of water vapor transmission through a material or assembly between its two parallel surfaces to the vapor pressure differential between the surfaces. (See also **water vapor transmission, permeability, and perm**.)

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permeation grouting—see **grouting, permeation**.

petrographic examination—methods of examining nonmetallic matter under suitable microscopes to determine structural relationships and to identify the phases or minerals present; with opaque materials, the color, hardness, reflectivity, shape, and etching behavior in polished sections serve as means of identification.

pH—a measure of the acidity or alkalinity of a solution, with neutrality represented by a value of 7, with increasing acidity represented by increasingly smaller values and with increasing alkalinity represented by increasingly larger values.

pigment—an insoluble fine powder mixed with water, oil, or other base that creates color.

pinhole—a coating defect characterized by minute holes through a coating that expose an underlying coat or the substrate.

pitting—development of relatively small surface cavities, such as popouts in concrete or corrosion of steel.

placing—the deposition, distribution, and consolidation of a freshly mixed concrete repair material in the place where it is to harden.

plane of weakness—the plane along which a composite repair system tends to fracture.

plastic shrinkage—see **shrinkage, plastic**.

plastic shrinkage cracks—see **cracking, plastic**.

plasticizer—(1) a material that increases the plasticity of a fresh cementitious repair material. (2) a substance added to an adhesive to increase softness, flexibility, and extensibility. (3) a substance added to polymer or copolymer to reduce its minimum film forming temperature or its glass transition temperature.

pneumatic feed—equipment that uses compressed air to deliver shotcrete.

pneumatically applied mortar—see **shotcrete**.

polishing—(1) abrasion of wearing course aggregates caused by traffic loads and the environment. (2) the use of abrasives to smooth a surface.

polyester resin—see resin, polyester.

polyethylene—a thermoplastic high-molecular-weight organic compound used in formulating protective coatings or, in sheet form, as a protective cover for cementitious materials during the curing period.

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polymer—a high-molecular-weight organic compound, natural or synthetic, containing repeating units.

polymer-modified concrete—see **concrete, polymer-cement**.

polymer concrete—see **concrete, polymer**.

polymer cure—the use of heat, radiation, or reaction with chemical additives to change in the properties of a polymeric system into a final, more stable, usable condition.

polymer flooring—a liquid, with or without fillers or reinforcement, that is applied to a substrate and cured by heat or catalysts to form a thermo-set polymer that bonds to and protects the substrate and provides a barrier for containment of chemicals.

polymer flooring system—any combination of liquid-polymer products used as sealers, coatings, or mortars for application to concrete for repair, protection, or enhancement.

polymer mortar—see **mortar, polymer**.

polymer mortar, conductive—see **conductive-polymer mortar**.

polymerization—the chemical 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.

polyolefin fibers—see **fibers, polyolefin**.

polypropylene—highly chemically inert, long-chain synthetic polymer; fibrillated and monofilament fibers for concrete reinforcement. (See also **fibers, polypropylene**.)

polystyrene—a polymer prepared by the polymerization of styrene as the sole monomer.

polysulfide—synthetic polymers obtained by the reaction of sodium polysulfide with organic dichlorides.

polyurethane—reaction product of an isocyanate with any of a wide variety of other components containing an active hydrogen group; used to formulate tough, abrasion-resistant coatings and matrices.

polyvinyl acetate—colorless, permanently thermoplastic resin; usually supplied as an emulsion or water-dispersible powder characterized by flexibility, stability towards light, transparency to ultraviolet rays, high dielectric strength, toughness, and hardness.

popout—the breaking away of small portions of a concrete surface due to localized internal pressure which leaves a shallow, typically conical, depression; small popouts leave holes up to 10 mm in diameter, medium popouts leave holes 10 to 50 mm in diameter, large popouts leave holes greater than 50 mm in diameter.

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pore—an inherent or induced cavity within a particle or within an object; a discontinuity, essentially circular in cross section, in a coating extending through to the underlying coating or the basis material.

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.

port—see **injection port**.

port adapter—device used to connect an injection hose to a crack or void; may be attached to the concrete surface along a crack or inserted in holes drilled into the concrete.

portland cement—see **cement, portland**.

positive displacement—equipment that uses a piston or auger to push a solid mass of wet-mix shotcrete through the delivery hose.

positive side waterproofing—applying waterproofing material to the side of a structural element subjected to hydrostatic pressure.

post-tensioning—method of prestressing in which internal or external prestressing tendons are tensioned after concrete has hardened.

post-tensioning, bonded—post-tensioned construction in which the annular spaces around the tendons are grouted after stressing, thereby bonding the tendon to the concrete section.

post-tensioning, external—post-tensioned construction in which tensile forces are maintained through anchorages at each end of the exposed tendons.

post-tensioning, unbonded—post-tensioned construction where tendons are permanently prevented from bonding to the concrete after stressing.

potable water—water that is safe for drinking.

pot life—time interval after preparation during which a liquid or plastic mixture is to be used.

powder lance—equipment for cutting concrete with intense heat generated by the reaction between oxygen and powdered metals.

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

practical coverage—the spreading rate of a coating calculated at the recommended dry film thickness and assuming 15% material loss.

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preconditioning—any preliminary exposure of a material to the influence of specified atmospheric conditions for the purpose of favorably approaching equilibrium with a prescribed atmosphere.

predampening—adding water to aggregate that will be used in dry-mix shotcrete to bring the moisture content of the aggregate to a specified amount, usually 3 to 6%.

prepackaged—dry ingredients of grout, mortar, and concrete mixtures in packages, requiring only the addition of water to produce grout, mortar, or concrete.

prepacked concrete—see **concrete, preplaced-aggregate**.

preplaced-aggregate concrete—see **concrete, preplaced-aggregate**.

preservation—the process of maintaining a structure in its present condition and arresting further deterioration. (See also **maintenance** and **protection**).

presplitting—a procedure in which hydraulic splitters, water pressure pulses, or expansive chemicals are used in bore holes drilled at points along a predetermined line to induce a crack plane for the removal of concrete.

pretensioning—a method of prestressing reinforced concrete in which the tendons are tensioned before the concrete is placed.

prestress—to place a hardened-concrete member or an assembly of units in a state of compression before application of service loads; the stress developed by prestressing, such as by pretensioning or post-tensioning. (See also **concrete, prestressed; pretensioning; post-tensioning; and steel, prestressing**.)

prewetting—adding a portion of the mixing water to dry-mix shotcrete materials in the delivery hose at some distance from the nozzle.

primer—the first coat of a material applied following surface preparation; serves to improve the bond of subsequent coats and may have corrosion inhibitive properties for use on metals.

production lot—that part of one manufacturer's production made from the same nominal raw material under essentially the same conditions and designed to meet the same specifications.

profilometer—measuring equipment used to determine a surface's profile in order to quantify its roughness.

promoter—substance that activates catalysts and promotes polymerization.

proportioning—selection of proportions of ingredients to make the most economical use of available materials to produce cementitious repair materials with the required properties. (See also **mixture**.)

proprietary—made and marketed by one having the exclusive right to manufacture and distribute.

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protection—the process of maintaining a concrete structure in its present or restored condition by minimizing the potential for deterioration or damage in the future. (See also **maintenance** and **preservation**.)

pull-off test—see **test, tensile pull-off**.

pullout test—a test that measures the force required to extract an embedded insert from a concrete mass; the measured ultimate pullout load is used to estimate the in-place compressive strength of the concrete.

pulse-echo—a nondestructive testing method based on stress wave propagation; the presence and position of a reflector, such as a crack or void, are indicated by the echo amplitude and time.

pulse velocity—the velocity at which compressional or other waves are propagated through a medium.

pultrusion—process by which a molten or curable resin and continuous fibers are pulled through a die of a desired structural shape of constant cross section, usually to form a rod or tendon.

pumpability—a measure of the properties of a particular grout mix to be pumped as controlled by the equipment being used, the formation being injected, and the engineering objective limitations.

pumped concrete—see **concrete, pumped**.

pumping test—a field procedure used to determine in situ permeability or the ability of a formation to accept grout.

—Q—

quality assurance—steps taken by or for the owner to assure the quality of the work.

quality control—steps taken by the contractor to control quality of the work.

—R—

radar—a nondestructive testing method for locating metal embedments, voids beneath pavements, or determining thickness of members; interface between materials with different dielectric properties results in reflection of a portion of incident electromagnetic pulse.

radiography—a nondestructive testing method for locating reinforcing and prestressing steel, conduits, pipes, voids, and honeycomb; the intensity of high-energy electromagnetic radiation which passes through a member is recorded on photographic film.

ramming—using a heavy blunt tool to tamp concrete. (See also **dry pack**, and **tamping**.)

rapid chloride test—a method for on-site determinations of acid-soluble and water-soluble chloride ion contents of concrete powder samples with proprietary chloride extraction liquids and calibrated instrument probes.

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reactant—a material that reacts chemically with the base component of a grout system.

reactive aggregate—see **aggregate, reactive**.

rebound—aggregate and cement, or wet shotcrete, that bounces away from the surface against which shotcrete is being projected.

rebound hammer—a nondestructive testing apparatus that provides a rapid indication of the near-surface mechanical properties of hardened cementitious materials based on the distance of rebound of a spring driven plunger.

reflective cracking—see **cracking, reflective**.

refusal—point in a grouting process when the resistance of the formation is equal to the pressure developed by the injection pump so that grout flow ceases.

rehabilitation—the process of repairing or modifying a structure to a desired useful condition. (See also **repair**, and **restoration**.)

reinforcement—(1) bars, wires, strands, fibers, or other slender members which are embedded in concrete primarily to improve tensile strength; (2) fibers and fillers that improve the physical strength of coating systems.

reinforcement continuity—see **continuity, reinforcement**.

relative humidity—the ratio of the quantity of water vapor in the air to the maximum amount the air would hold at the same temperature, expressed as a percentage.

release agent—material used to prevent bonding of concrete to a surface. (See also **bond breaker**.)

render—to apply a coat of mortar by a trowel or float.

repair—to replace or correct deteriorated, damaged, or faulty materials, components, or elements of a structure. (See also **rehabilitation**, and **restoration**.)

repair, full-depth—removal and replacement of damaged or deteriorated concrete that constitutes the full depth of a member or element.

repair, nonstructural—protective repair that is not intended to affect the structural capacity of a member.

repair, partial-depth—removal and replacement of damaged or deteriorated near-surface concrete that constitutes only a portion of the depth of a member or element.

repair, structural—repair that restores or enhances the structural capacity of a member.

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repair process—the complete process of evaluating an existing structure, the design and implementation of stabilization measures and repairs; the repair process is complete when the use of repaired structure is transferred to the Owner and/or the repair contract terms are completed.

repair systems—the materials and techniques used for repair.

resin—a natural or synthetic, solid or semisolid, organic material of indefinite and often high molecular weight having a tendency to flow under stress; usually has a softening or melting range, and usually fractures conchoidally.

resin, acrylic—one of a group of thermoplastic resins formed by polymerization of the esters or amides in acrylic acid used to make polymer-cement and polymer mortars and concretes; used in concrete maintenance and repair as a surface sealer or bonding agent.

resin, epoxy—a class of organic chemical bonding systems used in the preparation of special coatings for concrete, as adhesives for injection of cracked concrete, or as binders in epoxy-resin mortars, concretes, and fiber-reinforced polymer composites.

resin, furan—a thermosetting catalyzed condensation reaction product from furfuryl alcohol, furfural or combination thereof.

resin, methacrylate—one of a group of resins formed by polymerizing the esters or amides of acrylic acids.

resin, polyester—one of a large group of synthetic resins, mainly produced by reaction of dibasic acids with dihydroxy alcohols; commonly prepared for application by mixing with a vinyl-group monomer and free-radical catalysts at ambient temperatures and used as binders for resin mortars and concretes, fiber laminates (mainly glass), adhesives, and the like; commonly referred to as unsaturated polyester.

resin, 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; silicones may be used in caulking or coating compounds or as admixtures for concrete.

resin, urea—a synthetic resin made from urea and an aldehyde.

resin, urethane—a class of resins obtained by the reaction of diisocyanates with organic compounds containing two or more active hydrogen atoms to form polymers having free isocyanate groups. Under the influence of heat or catalysts, the latter react with each other, with water, glycols, diamines, etc., to form a thermosetting material.

resin, vinyl ester—a thermosetting reaction product of epoxy resin with a polymerizable unsaturated acid, usually methacrylic acid, that is then diluted with a reactive monomer, usually styrene.

resin concrete—see **concrete, polymer**.

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restoration—the process of re-establishing the materials, form, and appearance of a structure to those of a particular era of the structure. (See also **rehabilitation**, and **repair**.)

restrained shrinkage test—test method (such as ASTM C1581) that attempts to simulate the complex interaction between load, strength gain, shrinkage, modulus of elasticity, creep, and other factors that govern the cracking potential of a restrained repair material.

restraint—internal or external restriction of free movement of fresh or hardened concrete, mortar, or grout.

retarder—see **admixture, retarding**.

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**.)

rheology—the science dealing with flow of materials, including studies of the handling and placing of freshly mixed concrete and mortar, the behavior of slurries and pastes, and the like deformation of hardened concrete.

rock pocket—a porous, mortar-deficient portion of hardened concrete consisting primarily of coarse aggregate and open voids; caused by leakage of mortar from the form, separation (segregation) during placement, or insufficient consolidation. (See also **honeycomb**.)

rod—sharp-edged cutting screed used to trim shotcrete to forms or ground wires. (See also **screed**.)

rodding—consolidating concrete with a tamping rod. (See also **tamping**.)

roller-compacted concrete—see **concrete, roller-compacted**.

roller compaction—use of a vibratory, or other type roller, to compact concrete.

rolling—an uneven, wavy, textured surface at the outer edge of a spray pattern resulting from the application of shotcrete at angles less than 90 deg to the receiving surface; the use of heavy metal or stone rollers on terrazzo topping to extract excess matrix.

rotary drilling—a process for drilling a hole with a rotating drill bit under constant pressure. (See also **percussion drilling**.)

roughness—a measure of the texture of a surface; quantified by the vertical deviations of a prepared concrete surface from an ideal plane. If these deviations are large, the surface is rough; if they are small the surface is smooth.

rout—to deepen and widen a crack to prepare it for patching or sealing.

roving—a collection of bundles of continuous glass fiber filaments, either as untwisted strands or as twisted yarns.

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runs—sagging and curtaining of a coating usually caused by improper mixing or poor application techniques.

rust—a corrosion product consisting primarily of hydrated iron oxide.

rustication—a strip of wood or other material attached to a form surface to produce a groove in the repair.

rutting—the formation of depressions in a concrete surface caused by the excessive loading and abrasive wearing action of traffic.

—S—

sacrificial anode—see **anode, sacrificial**.

sagging—nonuniform downward flow of a material that occurs between the time of application and setting. (See also **sloughing**).

sample—a portion of material taken from a larger quantity of material which serves to provide information that can be used as a basis for action on the larger quantity.

sampling—identifying and testing or removing materials or components from a structure for the purpose of conducting laboratory tests to determine material or structural properties or to further quantify physical condition.

sandblasting—a method of cutting or abrading a surface with a stream of sand ejected from a nozzle at high speed by compressed air. (See also **abrasive blasting**.)

sand pocket—a zone in concrete, mortar, or shotcrete containing fine aggregate with little or no cement.

sand streak—a streak of exposed fine aggregate in the surface formed concrete, caused by bleeding.

sanded grout—see **grout, sanded**.

saponification—alkaline hydrolysis of esters to produce the component soaps and alcohols.

saturated surface-dry—condition of an aggregate particle or other porous solid when the permeable voids are filled with water and no water is on the exposed surfaces.

saturation—as applied to aggregate or concrete: the condition such that no more liquid can be held or placed within it.

saturation, critical—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.

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saw cut—a cut in hardened concrete made by abrasive blades, discs, or diamond wires.

scabblor—equipment for removal of concrete and coatings by chipping with piston-driven cutting heads placed at a right angle to the surface.

scaling—local flaking or peeling away of the near-surface portion of hardened concrete or mortar; also of a layer from metal. (See also **peeling**, and **spalling**.)

Note: **light scaling** of concrete does not expose coarse aggregate; **medium scaling** involves loss of surface mortar to 5 to 10 mm in depth and exposure of coarse aggregate; **severe scaling** involves loss of surface mortar to 5 to 10 mm in depth with some loss of mortar surrounding aggregate particles 10 to 20 mm in depth; **very severe scaling** involves loss of coarse aggregate particles as well as mortar generally to a depth greater than 20 mm.

scarifier—milling equipment for removal of concrete or brittle coatings by fracturing and pulverizing with rotary impact cutters held at a right angle to the surface.

scarification—the process of scratching, cutting, or chipping a substrate to clean and texture the surface.

Schmidt hammer—see **rebound hammer**.

scour—erosion of a concrete surface, exposing the aggregate.

screed—(1) to strike off concrete lying above the desired plane or shape. (2) a tool for striking off the concrete surface, sometimes referred to as a **strikeoff**.

screed wire—see **ground wire**.

screeding—the operation of forming a surface by the use of screed guides and a strikeoff. (See also **strikeoff**.)

seal—a barrier against the passage of liquids, solids, or gases.

sealant—a material that has adhesive and cohesive properties to form a seal.

sealant, field-molded—a liquid or mastic sealant that is shaped by the joint into which it is placed.

sealant, joint—compressible material used to exclude water and solid foreign materials from joints.

sealant, structural—a sealant capable of transferring required loads between adjacent structural elements.

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sealer—a liquid that is applied to the surface of hardened concrete to either prevent or decrease the penetration of liquid or gaseous media, for example water, aggressive solutions, and carbon dioxide, during service exposure.

sealing compound—see **sealer**.

section enlargement—see **strengthening, section enlargement**.

seepage—the infiltration or percolation of water through a material to or from the surface.

segregation—the differential concentration of the components of mixed concrete, aggregate, or the like, resulting in nonuniform proportions in the mass. (See also **bleeding** and **separation**.)

self-leveling—the process whereby a material exhibits flow sufficient to seek gravitational leveling.

separation—divergence from the mass and differential accumulation of coarse aggregate during movement of the concrete; the gravitational settlement of solids from a liquid.

series grouting—see **grouting, series**.

service condition—the combination of load and environmental exposure that a structure or material may be subjected to during its design life.

service life—an estimate of the remaining useful life of a structure based on the current rate of deterioration or distress, assuming continued exposure to given service conditions without repairs.

set—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, false—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 **set, flash**.)

set, final—a degree of stiffening of a mixture of cement and water greater than initial set, generally stated as an empirical value indicating the time in hours and minutes required for a cement paste to stiffen sufficiently to resist, to an established degree, the penetration of a weighted test needle; also applicable to concrete and mortar mixtures with use of suitable test procedures. (See also **set, initial**.)

set, flash—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 referred to as quick set or grab set. (See also **set, false**.)

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set, initial—a degree of stiffening of a mixture of cement and water less than final set, generally stated as an empirical value indicating the time in hours and minutes required for cement paste to stiffen sufficiently to resist to an established degree, the penetration of a weighted test needle; also applicable to concrete or mortar with use of suitable test procedures. (See also **set, final**.)

set, permanent—inelastic elongation or shortening.

settlement—(1) downward movement of a structure, part of a structure, or underpinning. (2) sinking of solid particles in grout, mortar, or fresh concrete, after placement and before initial set.

settlement shrinkage—see **shrinkage, settlement**.

shear—an internal force tangential to the plane on which it acts.

shear-bond strength—see **strength, shear bond**.

shear collar—enlarged column section immediately below a slab that aids in transfer of shear stresses from the slab into the supporting column.

shear stress—the stress component acting tangentially to a plane.

sheath—enclosure around prestressing steel to avoid temporary or permanent bond between the steel and surrounding concrete. (See also **duct**.)

shelf life—the length of time packaged materials can be stored under specified conditions and still remain usable.

shooting—placing of shotcrete. (See also **gunning**.)

shoring—temporary members added to supplement the gravity or lateral strength of the structure.

short-pulse radar—a technique for nondestructive detection of delaminations and other types of defects within a concrete mass.

shotblasting—surface preparation method in which steel shot is centrifugally propelled at high velocity onto a surface; the process is confined in an enclosed blast chamber which recovers and separates dust and reusable shot.

shotcrete—mortar or concrete pneumatically projected at high velocity onto a surface; also known as air-blown mortar, pneumatically applied mortar or concrete, and sprayed concrete. (See also **shotcrete, dry-mix; pneumatic feed; positive displacement; and shotcrete, wet-mix**.)

shotcrete, dry-mix—shotcrete in which most of the mixing water is added at the nozzle.

shotcrete, wet-mix—shotcrete in which the ingredients, including water, are mixed before introduction into the delivery hose; accelerator, if used, is normally added at the nozzle.

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shrinkage—a decrease in one or more dimensions of an object or material. (See also **contraction** and **volume change**.)

shrinkage, carbonation—shrinkage caused by carbonation.

shrinkage, drying—shrinkage resulting from loss of moisture.

shrinkage, plastic—shrinkage that occurs prior to setting of a cementitious material.

shrinkage, settlement—a reduction in volume of concrete prior to the final set of cementitious mixtures, caused by settling of the solids. (See also **shrinkage, plastic** and **volume change, autogenous**.)

shrinkage-compensating—a characteristic of grout, mortar, or concrete made using an expansive cement in which volume increases after setting, if properly elastically restrained, induces compressive stresses which are intended to approximately offset the tendency of drying shrinkage to induce tensile stresses. (See also **cement, expansive**.)

shrinkage crack—see **crack, shrinkage**.

shrinkage cracking—see **cracking, drying shrinkage**.

shrinkage-reducing admixture—see **admixture, shrinkage-reducing**.

silane—a low-molecular-weight compound of silicon and hydrogen, solutions of which are used as penetrating sealers for concrete surfaces.

silica fume—very fine noncrystalline silica produced in electric arc furnaces as a byproduct of the production of elemental silicon or alloys containing silicon.

silicone—see **resin, silicone**.

siloxane—a silicon and oxygen-based compound, also containing carbon and hydrogen, used as a penetrating sealer for concrete surfaces.

skinning—the formation of a solid membrane on the top of a liquid, caused by partial curing or drying of a coating during storage.

slabjacking—the process of either raising concrete slabs or filling voids under them, or both, by pressure injecting cementitious or noncementitious materials under the slabs.

slag—see **blast-furnace slag**.

slag cement—see **cement, slag**.

slant-shear bond strength—see **strength, slant-shear bond**.

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slip—movement occurring between steel reinforcement or other embedded items and concrete, indicating degraded or ineffective anchorage.

slip resistance—the frictional force opposing movement of an object across its surface. (See also **coefficient of friction**.)

sloughing—subsidence of shotcrete, or other repair materials placed vertically or overhead; 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.

slurry—a mixture of water and any finely divided insoluble material, such as portland cement, slag, or clay in suspension.

slush grouting—see **grouting, slush**.

sodium chloride—common salt.

soffit—the underside of an element or structure, such as a beam, staircase, arch, or cornice.

solids content—the percentage by weight of the nonvolatile matter in an adhesive.

soluble chloride—the fraction of the total chloride-ion content within hardened concrete that is available to act in the electrochemical process of reinforcing steel corrosion.

solvent—a liquid capable of dissolving another material.

solvent entrapment—the encapsulation of solvent within a cured coating because of improper drying conditions; results in a discontinuous coating system.

sonic echo—a nondestructive testing method for determining the length of deep foundations or the location of cracks or constrictions; a hammer is used to impact the surface and a receiver monitors reflected stress wave.

sounding—a technique to evaluate the condition of hardened concrete by striking the surface with a hammer; sound concrete will exhibit a clear ringing sound, whereas dull or hollow sounds indicate delaminated areas. (See also **chain drag** or, more broadly, **acoustic impact**.)

sounding well—a vertical pipe, with closely spaced openings, positioned in a mass of coarse aggregate for grout injection of preplaced aggregate concrete, a float on a measured line indicates the grout level.

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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.

spall—a fragment, usually in the shape of a flake, detached from a larger mass by a blow, by the action of weather, by pressure, or by expansion within the larger mass; a small spall involves a roughly circular depression not greater than 120 mm in depth and 150 mm in any dimension; a large spall, may be roughly circular or oval or in some cases elongated, is more than 20 mm in depth and 150 mm in greatest dimension.

spalling—the development of spalls.

specific gravity—the ratio of the mass of a volume of a material at a stated temperature to the mass of the same volume of distilled water at a stated temperature.

specification—an explicit set of requirements to be satisfied by a material, product, system, or service.

specification, performance-based—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.

spectral analysis of surface waves (SASW)—a nondestructive test method for determining the stiffness profile of a pavement system or the depth of deteriorated concrete; impact is used to generate a surface wave and two receivers monitor the surface motion.

splice—connection of reinforcing bars or prestressing tendons to one another by lapping, welding, mechanical couplers, or other means.

splice, center stressing—a device that allows stressing and splicing to occur from an intermediate location along the length of a tendon. Also called a stressing coupler or colloquially a “dogbone” coupler because of its shape.

splice, coupler—a device for connecting reinforcing bars or prestressing tendons end to end.

splice, Y— a device that provides for tendon stressing at a splice location.

splitting tensile strength—see **strength, splitting tensile**.

sprayed concrete—see **shotcrete**.

spray-up application—technique in which continuous-strand roving is fed into a chopper gun, which chops the roving into predetermined lengths and simultaneously sprays the chopped fibers and a cementing matrix onto a surface.

stage grouting—see **grouting, stage**.

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stain—discoloration by foreign matter.

stalactite—a downward-pointing deposit formed as an accretion of mineral matter produced by evaporation of dripping water from the surface of rock or of concrete, commonly shaped like an icicle.

stalagmite—an upward-pointing deposit formed as an accretion of mineral matter produced by evaporation of dripping water from the surface of rock or of concrete, commonly conical in shape.

standard—(1) a physical reference used as a basis for comparison or calibration; (2) a concept that has been established by authority, custom, or agreement to serve as a model or rule in the measurement of quality or the establishment of a practice or procedure.

steel reinforcement—bars, wires, strands, tendons, fibers, mesh or other steel elements that are embedded in a matrix primarily to resist tensile forces.

steel reinforcement, epoxy coated—steel bars with a fusion-bonded epoxy coating designed to increase corrosion resistance.”

steel reinforcement, high-strength—steel with a high yield point; in the case of reinforcing bars, a minimum of 60,000 psi (414 MPa) with typically higher strengths of 75,000 and 100,000 psi (517 and 690 MPa).

steel reinforcement, galvanized—steel that has been passed through a molten bath of zinc at a temperature of around 860 °F (460 °C); typically used for applications requiring the strength of steel and resistance to corrosion.

steel reinforcement, prestressing—high-strength steel, most commonly strand, wire, or bars used to impart permanent prestress forces to concrete.

steel reinforcement, stainless—steel alloy with a minimum of 11% chromium content by mass; more resistant to corrosion compared to conventional steel reinforcement.

stiffening, early—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 set, quick set, or flash set.

stitch drilling—procedure for removal of concrete with overlapping bore holes along the perimeter of the section to be removed.

stitching—a method for repair of cracks that involves drilling holes on both sides of the crack and grouting in stitching dogs (U-shaped metal units with short legs) that span the crack; may be used when tensile strength must be reestablished across major cracks.

straightedge—a rigid, straight piece of either wood or metal used to strikeoff or screed a concrete surface to proper grade or verify the planeness of a finished grade. (See also **rod**, **screed**, and **strikeoff**.)

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strain—the change in length per unit of length, in a linear dimension of a body; a dimensionless quantity that may be measured conveniently in percent, in inches per inch, in millimeters per millimeter, but preferably in millionths.

strand—a prestressing tendon composed of a number of wires twisted about the center wire or core.

stratification—the separation of overwet or over vibrated concrete into horizontal layers with increasingly lighter material toward the top; a layered structure in concrete resulting from placement of successive batches that differ in appearance.

strength—the ability of a material to resist strain or rupture induced by internal or external forces.

strength, bond—resistance to separation of a repair from the existing substrate or from reinforcing and other materials with which it is in contact.

strength, compressive—the measured maximum resistance of a test specimen to axial compressive loading; expressed as force per unit cross-sectional area.

strength, flexural—the property of a solid that indicates its ability to resist failure in bending. (See also **modulus of rupture**.)

strength, pull-off—the tensile bond strength or tensile strength calculated by dividing the tensile load at failure by the area of the test specimen.

strength, shear-bond—a measure of the ability of a repair to resist shear stresses along the interface between the repair material and the concrete substrate.

strength, slant-shear bond—adhesive bond strength measured by applying a compressive force to a cylinder or prism that is comprised of two segments joined along a surface diagonal to the direction of the compressive force.

strength, splitting tensile—tensile strength of concrete determined by a diametrical compression test.

strength, tensile—maximum unit stress that a material is capable of resisting under axial tensile loading; based on the cross-sectional area of the specimen before loading.

strength, tensile bond—the unit stress, applied in direct tension, required to separate a hardened repair material from other materials with which it is in contact with failure occurring in or near the bonded interface.

strengthening—the process of restoring the capacity of weakened components or elements to their original design capacity or increasing the strength of components or elements of a concrete structure. (See also **strengthening, external**.)

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strengthening, active—systems that typically engage the structure instantaneously; may be accomplished by introducing external forces to a member that counteract the effects of internal forces.

strengthening, external—application of bonded or anchored reinforcing or post-tensioning elements, e.g., steel or fiber-reinforced polymer composites, on exterior of structural members to increase the flexural, shear, or axial strength, or ductility of existing structural elements; external strengthening elements include plates, wraps, tendons, and the like.

strengthening, passive—systems that are typically engaged only when additional loads, beyond those existing at the time of installation, are applied to the structure; includes steel plates or fiber-reinforced polymer (FRP) composites bonded to members.

strengthening, primary—type of system required when design service loads (without load factors) exceed the nominal strength of an unstrengthened element; includes section enlargement, span shortening, and supplemental supports.

strengthening, section enlargement—placement of additional concrete on an existing structural concrete member; addition may be reinforced structural concrete to increase load-carrying capacity or protective concrete to improve fire resistance or protect against mechanical and environmental damage.

strengthening, span shortening—erection of new intermediate supports some distance from existing supports for an overstressed member; includes vertical columns, diagonal bracing, and lateral beams.

strengthening, supplemental—type of system appropriate for situation where design service loads (without load factors) are less than the existing capacity of unstrengthened element.

stress—intensity of internal force (i.e., force per unit area) exerted by either of two adjacent parts of a body on the other across an imagined plane of separation.

stress corrosion—the process in which the damage caused by stress and corrosion acting together is significantly greater than that produced when they act individually.

stress-corrosion cracking—see **cracking, stress-corrosion**.

stress relaxation—the time-dependent decrease in stress in a material held at constant strain. (See also **creep**.)

strikeoff—to remove material in excess of that which is required to fill the form or repair cavity evenly and bring the surface to grade; performed with a straightedge piece of wood or metal by means of a forward sawing movement or by a power operated tool appropriate for this purpose; also the name applied to the tool. (See also **screed** and **screeding**.)

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structural adhesive—a bonding agent used for transferring required loads between adjacent structural elements.

structural sealant—see **sealant, structural**.

styrene butadiene—a synthetic resin which is a copolymer of styrene and butadiene; available as a latex emulsion and in a form which can be dissolved in aromatic solvents to form alkali-resistant coatings.

substrate—the layer immediately under a layer of different material to which it is typically bonded; an existing concrete surface that receives an overlay, partial-depth repair, protective coating, or some other maintenance or repair procedure.

sulfate attack—either a chemical or a physical reaction or both between sulfates usually in soil or water and concrete or mortar; the chemical reaction is primarily with calcium aluminate hydrates in the cement-paste matrix, often causing deterioration.

superplasticizer—see **admixture, water-reducing (high range)** (preferred term).

supplemental reinforcement—additional reinforcement installed in a repair section when the original reinforcement was inadequate, the reinforcement has lost cross section, or the existing member is to be strengthened.

surface hardeners—metallic particles or hard mineral aggregate usually passing No. 16 sieve size, mixed with cement; generally applied by sprinkling on the surface of plastic concrete, or other repair material, and repeated troweling to produce a dense layer.

surface impregnants—low viscosity, surface penetrating liquids which impart a degree of water repellency to the surface.

surface preparation—the process whereby a method or combination of methods is used to remove deteriorated or contaminated concrete and roughen and clean a substrate to enhance bond of a repair material or protective coating.

surface profile—the topographic contour of the exposed surface of a material or substrate.

surface repair—repair of a concrete surface, e.g., application of an overlay, or repair of near-surface concrete that constitutes only a small portion of the depth of a member or element. (See also **repair, partial-depth**.)

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, to facilitate construction joint cleanup, or to facilitate production of an exposed-aggregate finish.

surface sealers—(1) in epoxy injection, the material placed over cracks to contain the liquid adhesive during the injection process before the adhesive gels. (2) protective surface treatments 10 mils (0.25 mm) or less in thickness which are generally applied with brush, roller, squeegee, or spray.

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surface tension—a measure of surface energy created by the predisposition of molecular forces at the surface of a liquid to confine the volume of the liquid to a minimum area.

surface texture—degree of roughness or irregularity of the exposed surfaces.

surface vibrator—a vibrator applied to the surface of freshly placed repair materials to consolidate the mass; four principal types exist: vibrating screeds, pan vibrators, plate or grid vibratory tampers, and vibratory roller screeds.

suspension—a relatively coarse, noncolloidal dispersion of solid particles in a liquid.

swelling—increase in either length or volume. (See also **contraction**, **expansion**, **volume change**, and **volume change, autogenous**.)

syneresis—the exudation of small amounts of liquid from a gel accompanied by contraction of the gel.

synthetic fibers—see **fibers, synthetic**.

—T—

tacky—the sticky condition of an adhesive prior to hardening.

tamper—(1) an implement used to consolidate concrete or mortar in molds, forms, or repair cavities. (2) a hand-operated device for consolidating floor topping or other unformed repair materials 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 finishing.

tamping—the operation of consolidating freshly placed concrete or other repair materials by repeated blows or penetrations with a tamper. (See also **consolidation** and **rodding**.)

temper—to add water to a cementitious mixture as necessary to initially bring the mixture to the desired workability. (See also **retemper**.)

temperature cracking—see **cracking, temperature**.

temperature rise—the increase of temperature caused by either absorption of heat or internal generation of heat, e.g., hydration of cement in concrete.

temporary bracing—temporary supplemental members added to an existing structure to prevent local or global instability during evaluation and repair construction.

tendon—a steel element such as wire, cable, bar, rod, or strand, or a bundle of such elements, typically used in tension to impart compressive stress to concrete and as external strengthening to increase structural capacity.

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tendon, bonded—a prestressing tendon that is bonded to the concrete through grouting or other approved means and; therefore, not free to move relative to the concrete.

tendon, unbonded—a tendon that is permanently free to move relative to the concrete being stressed.

tendon profile—the path or trajectory of the prestressing tendon.

tensile bond strength—see **strength, tensile bond**.

tensile pull-off test—see **test, tensile pull-off**.

tensile strength—see **strength, tensile**.

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.

test, compression—test made on a test specimen of mortar or concrete to determine the compressive strength; in the United States, unless otherwise specified, compression tests of mortars are made on 2 in. (50 mm) cubes and compression tests of concrete are made on cylinders 6 in. (152 mm) in diameter and 12 in. (305 mm) high.

test, tensile pull-off—a test to determine the unit stress, applied in direct tension, required to separate a hardened repair material from the existing concrete substrate. The test may also be used to determine the maximum unit stress that the existing concrete substrate is capable of resisting under axial tensile loading and the near-surface tensile strength of a prepared surface.

thermal compatibility—see **compatibility, thermal**.

thermal conductivity—see **conductivity, thermal**.

thermal contraction—contraction caused by decrease in temperature.

thermal cutting—procedure for removal of concrete with thermal or powder lances that employ intense heat generated by the reaction between oxygen and powdered metals to melt a slot into concrete. (See also **thermal lance**.)

thermal expansion—expansion caused by increase in temperature.

thermal shock—the subjection of a material or body to a rapid change in temperature that may be expected to have a potentially deleterious effect.

thermal lance—equipment for cutting concrete with intense heat generated by the reaction between oxygen and powdered metals. (See also **thermal cutting**.)

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thermocouple—two conductors of different metals joined together at both ends, producing a loop in which an electric current will flow when there is a difference in temperature between the two junctions.

thermography, infrared—see **infrared thermography**.

thermoplastic—a material that can be repeatedly softened by heating and hardened by cooling.

thermosetting—capable of assuming a rigid, fixed shape when cured by heat or other means.

thixotropy—the property of a material that enables it to acquire a lower viscosity when mechanically agitated and rapidly stiffen upon subsequent rest; a material having this property is termed thixotropic and can be placed vertically or horizontally without sagging during the curing process.

time-dependent deformation—see **deformation, time-dependent**.

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. (See also **keyway**.)

tolerance—the permissible deviation from a specified dimension, quantity, location or alignment.

tooling—the act of compacting and contouring a material in a joint.

topping—(1) a layer of concrete, mortar, or other material placed to form a floor or surface on a concrete base; (2) a structural, cast-in-place surface for precast floor and roof systems; and (3) the mixture of marble chips and matrix that, when properly processed, produces a terrazzo surface.

topping, dry—see **dry-shake** (preferred term).

topping, monolithic—on flatwork: a higher quality, more serviceable topping course placed promptly after the base course has lost all slump and bleed water.

toughness—the property of matter that resists fracture by impact or shock.

toxic—poisonous.

transverse crack—see **crack, transverse**.

tremie—a pipe or tube through which concrete is deposited under water, having at its upper end a hopper for filling and a bail for moving the assemblage.

tremie concrete—see **concrete, tremie**.

tremie seal—the depth to which the discharge end of the tremie pipe is kept embedded in the fresh concrete that is being placed; a layer of tremie concrete placed in a cofferdam for the purpose of preventing the intrusion of water when the cofferdam is dewatered.

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trowel—a flat, broad-blade steel hand tool used to place, spread, shape, finish, or otherwise apply mortar or other materials; also used in the final stages of finishing operations to impart a relatively smooth surface to concrete and other materials.

trowel-applied—the placement of a repair where the material is transported and pressed into the prepared substrate using a trowel or similar tool.

trowel finish—see **finish, trowel**.

troweling—smoothing and compacting the unformed surface of materials by strokes of a trowel.

true solution—one in which the components are 100% dissolved in the base solvent.

tube a manchette—a grout pipe perforated with rings of small holes at intervals of about 12 in. (305 mm). Each ring of perforations is enclosed by a rubber sleeve that fits tightly around the pipe to act as a one-way valve when used with an inner pipe containing two packer elements that isolate a stage for injection of grout.

—U—

ultrasonic—pertaining to mechanical vibrations having a frequency greater than approximately 20,000 Hz.

ultrasonic echo—a nondestructive testing method for locating delaminations and voids in relatively thin elements with a transducer that emits a short pulse of ultrasonic waves which is reflected by the opposite side of an element or internal defect and recorded by an adjacent receiver.

ultrasonic pulse velocity—a nondestructive testing method for assessing the relative condition of hardened concrete by measuring the travel time of a pulse of ultrasonic waves through a section with a known path length.

unwatering—the interception, removal, or control of ponded or flowing surface water within structures or excavations. (See also **dewatering**.)

uplift—vertical displacement of a structure or formation because of grout injection.

urea—white crystals or powder, soluble in water and used as a deicer.

urea resin—see **resin, urea**.

urethane—see **resin, urethane**.

unsound—not firmly made, placed, or fixed; subject to deterioration or disintegration during service exposure.

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2010

—V—

vacuum blasting—a closed-loop abrasive blasting process whereby blasting material and associated debris are contained with a vacuum. (See also **shotblasting**.)

vacuum concrete—see **concrete, vacuum**.

vacuum impregnation—a repair process in which a vacuum applied to a concrete section causes polymers such as epoxy to impregnate the concrete surface or fill cracks and voids within the section.

vapor barrier—a moisture impervious layer that eliminates transmission of water vapor into a material or structure.

vapor retarder—a material that minimizes transmission of water vapor but is not 100% effective in preventing its passage.

vehicle—the liquid portion of coating in which pigment is dispersed; composed of binder and thinner.

vent—a hole or small-diameter pipe used in concrete construction to permit escape of air in a structure being concreted or grouted; also used to monitor the flow of grout.

vibration—(1) energetic agitation of freshly mixed concrete during placement by internal or external 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. (2) movement induced into a structure by the impact from mechanical concrete removal tools that may result in damage to the existing structure.

vibration modal analysis—the breaking down of a set of vibrations in a structure or component into independent frequencies and amplitudes.

vibrator—an oscillating machine used to agitate freshly-mixed materials such as concrete or mortar to produce a uniform material without gross voids, and to produce intimate contact with the substrate, boundary of repair cavity, form surfaces, and embedded materials.

vinyl ester resin—see resin, vinyl ester.

viscometer—instrument used for measuring viscosity of slurries, mortars, or concretes.

viscosity—the property of a material that resists change in the shape or arrangement of its elements during flow, and the measure thereof.

viscosity modifier—see **admixture, viscosity modifying**.

visual inspection—an evaluation procedure in which a qualified investigator observes, classifies, and documents deterioration or distress on exposed concrete surfaces; typically, one of the first steps in evaluation of a concrete structure.

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void—cavity enclosed within an otherwise solid mass; may be intentionally or unintentionally formed and may be filled with air, water, or other gaseous or liquid material.

void ratio—the ratio of the volume of void space to the volume of solids.

volatile content—the percentage of materials which evaporate from a coating.

volatile organic compounds (VOC)—a measure of the total amount of organic compounds evaporating from a coating film, excluding water.

volume change—an increase or decrease in volume of a material. (See also **deformation** and **deformation, time-dependent**.)

volume change, autogenous—change in volume produced by continued hydration of cement, exclusive of effects of applied load and change in either thermal condition or moisture content.

volume change, thermal—the increase or decrease in volume caused by changes in temperature. (See also **thermal contraction** and **thermal expansion**.)

—W—

wall, load-bearing—a wall designed and built to carry superimposed vertical or in-plane and shear loads, or both.

wall, veneer—the exterior layer of any wall system.

warping—a deviation of a surface from its original shape, usually caused by either temperature or moisture differentials, or both, within the material. (See also **curling**.)

washout—erosion of the surface layers of a freshly-mixed material by the flow of water over its surface, e.g., the washout of cement from concrete or mortar.

water —

water, absorbed— see **moisture, absorbed**.

water, adsorbed—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**.)

water, evaporable—water in set cement paste present in capillaries or held by surface forces; measured as that removable by drying under specified conditions. (See also **water, non-evaporable**.)

water, free—see **moisture, free**.

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water, non-evaporable—the water that is chemically combined during cement hydration; not removable by specified drying. (See also **water, evaporable**.)

water, mixing—the water in freshly mixed sand-cement grout, mortar, or concrete, exclusive of any previously absorbed by the aggregate (for example, water considered in the computation of the net water-cement ratio).

water absorption—the amount of water a material absorbs under specified test conditions. (See also **moisture, absorbed**.)

water-activated grout—see **grout, water-activated**.

water beading—surface property that causes the formation of discrete water droplets on a surface.

water blast—water discharged through a nozzle at high velocity; used to cut or abrade a concrete surface.

water-cement ratio—the ratio of the amount of water, exclusive only of that absorbed by the aggregates, to the amount of cement in a concrete, mortar, grout, or cement paste mixture; preferably stated as a decimal by mass and abbreviated *w/c*. (See also **water-cementitious material ratio**.)

water-cementitious material ratio—the ratio of the amount of water, exclusive only of that absorbed by the aggregate, to the amount of cementitious material in a concrete or mortar mixture. (See also **water-cement ratio**.)

water jet—stream of water flowing from a nozzle under high pressure (>10,000 psi) used to clean surfaces or remove concrete.

waterproof—impervious to water in either liquid or vapor state. (See also **dampproofing**.) (Since nothing can be completely “impervious” to water under infinite pressure over infinite time, this term should not be used.)

water-reducer—see **admixture, water-reducing**.

water-reducer (high-range)—see **admixture, water-reducing (high-range)**.

water ring—a device in the nozzle body of dry-mix shotcrete equipment through which water is added to the materials.

waterstop—a thin sheet of metal, rubber, plastic, or other material installed across a joint to impede seepage.

watertight—impermeable to water except when under hydrostatic pressure sufficient to produce structural discontinuity by rupture.

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water vapor permeability—the time rate of water vapor transmission through unit area of flat material of unit thickness induced by vapor pressure difference between two specific surfaces, under specified temperature and humidity conditions.

water vapor permeance—the time rate of water vapor transmission through unit area of flat material or construction induced by vapor pressure difference between two specific surfaces, under specified temperature and humidity conditions.

water vapor transmission—the rate of water vapor flow through a unit area of a material, normal to specific parallel surfaces, under specific conditions of temperature and humidity at each surface. (See also **permeability**; **permeance (water vapor)**; and **perm.**)

water vapor transmission rate—the steady water vapor flow in unit time through unit area of a body, normal to specific parallel surfaces, under specific conditions of temperature and humidity at each surface.

wearing course—a topping or surface treatment to increase the resistance of a concrete pavement or slab to abrasion.

weathering—degradation in color, texture, strength, chemical composition or other properties of a material caused by exposure to the weather.

wet blasting—a process for cleaning or finishing a surface by directing a water-based abrasive slurry at high velocity against the surface.

wet-mix shotcrete—see **shotcrete**, **wet-mix**.

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 used to reduce the surface tension of liquids so that solid surfaces can be wetted and liquids can penetrate the capillaries.

Windsor probe—a device developed to estimate the quality and compressive strength of insitu concrete by measuring the depth of penetration of probes driven into the concrete surface by means of a powder actuated driver.

workability—that property of freshly-mixed materials which determines the ease and homogeneity with which it can be mixed, placed, consolidated, and finished.

working life—the period of time during which an adhesive, after mixing with catalyst, solvent, or other compounding ingredients, remains sufficiently workable to permit application and spreading.

—X—

X-ray diffraction—the diffraction of X-rays by substances having a regular arrangement of atoms; a phenomenon used to identify substances having such a structure.

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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.

X-ray radiograph—an X-ray film, plate, or paper that is placed at the image plane and is used for recording an X-ray image of the object being examined.

—Y—

yellowing—discoloration of white or clear coatings caused by aging.

yield—the volume of a freshly mixed material produced from a known quantity of ingredients; the total weight of ingredients divided by the unit weight of the freshly mixed material.

yield point—that point on the stress-strain curve when stress ceases to be linearly proportional to strain.

Young's modulus—see **modulus of elasticity**.

—Z—

zero-slump concrete—see **concrete, zero-slump**.

Zahn cup—an apparatus for the measurement of liquid or slurry viscosity expressed as the number of seconds required for the liquid or slurry to drain from the cup through a hole of definite diameter.

zinc-rich primer—a primer that contains a high enough concentration of zinc dust to make it electrically conductive when it dries so that it provides cathodic protection for ferrous materials.