



Standard Terminology Relating to Hydraulic Cement¹

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1. Scope*

1.1 This terminology defines terms relating to hydraulic cements, their components, characteristics, properties, and the testing thereof. Some terms may have wider application than just to hydraulic cement.

1.2 See individual standards for terms applicable primarily therein, including meanings that may be more restrictive than those given here, and for explanations and descriptions of terms as they apply to those standards.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

C11 Terminology Relating to Gypsum and Related Building Materials and Systems

C51 Terminology Relating to Lime and Limestone (as used by the Industry)

C125 Terminology Relating to Concrete and Concrete Aggregates

C294 Descriptive Nomenclature for Constituents of Concrete Aggregates

C595/C595M Specification for Blended Hydraulic Cements

C1328 Specification for Plastic (Stucco) Cement

C1329 Specification for Mortar Cement

2.2 *ACI Standard:*

ACI 116R Cement and Concrete Terminology³

3. Significance and Use

3.1 In definitions of cements, ingredients are cited only when they are inherent to the definition, for example portland-

pozzolan cement. For ingredients and their quantity limits, if any, that are permitted or prohibited by a specification for a particular cement, see the applicable specification for that cement.

3.2 In definitions of materials including cements, the method of production is included only if it is inherent to the definition.

3.3 Related terms may be found in other terminology documents such as Terminology **C11**, Terminology **C51**, Terminology **C125**, and ACI 116R.

4. Terminology

addition, *n*—a material that is interground or blended in limited amounts into a hydraulic cement during manufacture.

DISCUSSION—Two classes of additions are recognized as defined below.

functional addition, *n*—an addition introduced to modify one or more properties of a hydraulic cement.

air-entraining addition, *n*—a functional addition that will entrain air in mortar or concrete.

processing addition, *n*—an addition introduced to aid in the manufacture or handling, or both, of a hydraulic cement.

air-entraining addition, *n*—see **addition**; **functional addition**; **air-entraining addition**.

air content, *n*—of freshly mixed mortar the volume of air (and other gases) in mortar, expressed as a percentage of total volume of mortar.

air-entraining hydraulic cement, *n*—a hydraulic cement containing an air-entraining addition in such amount as to cause air to be entrained in mortar within specified limits when measured by the prescribed method.

alkali equivalent, *n*—deprecated term; see **equivalent alkalis**.

aluminous cement, *n*—deprecated term.

anhydrite, *n*—see **calcium sulfate**.

blast-furnace slag, *n*—the nonmetallic product, consisting essentially of silicates and aluminosilicates of calcium and

¹ This terminology is under the jurisdiction of ASTM Committee **C01** on Cement and is the direct responsibility of Subcommittee **C01.91** on Terminology.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, <http://www.aci-int.org>.

other bases, that is developed in a molten condition simultaneously with iron in a blast furnace.

blended hydraulic cement, *n*—a hydraulic cement consisting of two or more inorganic constituents (at least one of which is not portland cement or portland cement clinker) which separately or in combination contribute to the strength-gaining properties of the cement, (made with or without other constituents, processing additions and functional additions, by intergrinding or other blending).

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

portland-limestone cement, *n*—a hydraulic cement consisting of an intimate and uniform blend of portland cement and limestone produced by intergrinding portland cement clinker and limestone; by blending portland cement and finely divided limestone; or by a combination of intergrinding and blending, in which the amount of the limestone constituent is within specified limits.

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

DISCUSSION—Portland blast-furnace slag cement, portland-limestone cement, and portland-pozzolan cement are all blended hydraulic cements. See Specification C595/C595M for constituent limits.

blending, *n*—in hydraulic cement manufacture, a process in which two or more ingredients are combined into an intimate and uniform product of finely divided dry material, as by intergrinding or mixing, or both.

calcium sulfate, *n*—in cement manufacture, a material composed essentially of calcium sulfate in one or more of its hydration states: **anhydrite** (CaSO_4), **gypsum** ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), or **calcium sulfate hemihydrate** ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$).

calibration, *n*—of measuring instrument, a process that, under specified conditions and following a standard procedure, establishes metrological traceability by determining: (1) the relationship between the quantity values provided by measurement standards or certified reference materials and the corresponding indications from a measuring instrument or system; and (2) the estimated uncertainty of measurements made subsequently with the instrument or system.

DISCUSSION—Calibration takes into account systematic error (or bias) of the measuring instrument or system as well as random error that is

associated with the use of the measurement instrument or system and error associated with the measurement standards or certified reference materials. Calibration should not be confused with an adjustment of a measuring instrument or with verification of a measuring instrument. Sometimes the first step alone is mistakenly called calibration, but performing only the first step is the process of **standardization**. In tests of concrete and concrete aggregates, standardization of measuring instruments or systems is often sufficient.

cementitious material, (*hydraulic*), *n*—an inorganic material or a mixture of inorganic materials that sets and develops strength by chemical reaction with water by formation of hydrates and that is capable of doing so underwater.

cement paste, *n*—an unhardened or hardened mixture of finely divided hydraulic cementitious material and water.

early stiffening, *n*—rapid loss of plasticity or rapid development of rigidity in freshly mixed hydraulic cement paste, mortar, or concrete.

false set, *n*—with little evolution of heat, which can be dispelled by further mixing without the addition of water.

flash set, *n*—with evolution of considerable heat, which cannot be dispelled by further mixing without the addition of water.

equivalent alkalis, Na_2Oeq , *n*—in hydraulic cement, the total of sodium and potassium oxides as calculated from the chemical analysis, and using the formula:

$$\text{Na}_2\text{Oeq} = \% \text{Na}_2\text{O} + 0.658 \times \% \text{K}_2\text{O}.$$

DISCUSSION—Used to indicate the levels of alkalis in a material when only Na_2O and K_2O are considered. The value, 0.658, is the molecular ratio of Na_2O to K_2O . Alkali equivalent, soda equivalent, and sodium equivalent are deprecated terms.

expansive hydraulic cement, *n*—a hydraulic cement that forms a paste when mixed with water, and increases in volume a controlled amount during the early hardening period occurring after setting.

DISCUSSION—Expansive hydraulic cements are used to compensate for volume decrease due to shrinkage or to induce tensile stress in concrete reinforcement.

false set—see **early stiffening**.

flash set—see **early stiffening**.

fog room, *n*—a moist room in which the humidity is controlled by atomization of water.

gage length, *n*—in cement testing, the nominal length between the innermost ends of metal studs that are molded into a test specimen with the axis of the stud in each end of the test specimen coincident with the longitudinal axis of the test specimen and with each other.

granulated blast-furnace slag, *n*—the glassy, granular material formed when molten blast-furnace slag is rapidly chilled, as by immersion in water.

gypsum, *n*—see **calcium sulfate**.

hydration, *n*—the chemical reaction between hydraulic cement and water forming new compounds most of which have strength-producing properties.

hydraulic cement, *n*—a cement that sets and hardens by chemical reaction with water and is capable of doing so under water.

hydraulic mortar, *n*—deprecated term; see mortar.

length change, *n*—*in cement testing*, an increase or decrease in linear dimension due to causes other than applied load, usually measured along the longitudinal axis of a test specimen and expressed as a percentage of a gage length.

lime-saturated water, *n*—*for curing test specimens*, water containing calcium hydroxide at saturation and in contact with solid calcium hydroxide so that saturation is maintained.

lot, *n*—a quantity of a single material that is considered as a unit, such as that manufactured during a single production run, offered at one time for sale, or offered at one time for inspection, or the contents of one or more transport containers drawn from one or more bins of material from a single production run, sequentially packaged from one or more bins, or a group of samples secured from one of the above.

masonry cement, *n*—a hydraulic cement manufactured for use in mortars for masonry construction or in plasters, or both, which contains a plasticizing material and, possibly, other performance-enhancing addition(s).

moist room, *n*—an enclosed room for storage and curing of paste, mortar, and concrete specimens in which temperature and high relative humidity can be controlled within specified limits.

mortar, *n*—a mixture of finely divided hydraulic cementitious material, fine aggregate, and water in either the unhardened or hardened state; hydraulic mortar.

mortar cement, *n*—a hydraulic cement manufactured for use in masonry mortar designed for specific bond and air content criteria.

DISCUSSION—Mortar cement is similar to masonry cement but must meet bond strength and air content criteria. See Specification C1329 for limitations.

natural cement, *n*—a hydraulic cement produced by calcining a naturally occurring argillaceous limestone at a temperature below the sintering point and then grinding to a fine powder.

DISCUSSION—Argillaceous limestone is described in Standard C294.

normal consistency, *n*—a degree of plasticity of a hydraulic-cement paste that is appropriate for testing as measured by a stipulated method.

DISCUSSION—The result of tests for normal consistency is reported as the mass of water required to achieve this plasticity divided by the mass of hydraulic cement, expressed as a percentage.

plaster, *n*—*hydraulic cement*, a mixture of hydraulic cement, fine aggregate and water that hardens; used for coating surfaces, such as ceilings, walls and partitions.

plastic cement, *n*—a hydraulic cement used in plaster or stucco.

DISCUSSION—See Specification C1328 for limitations on materials or properties pertaining to cement under that specification.

portland cement, *n*—a hydraulic cement produced by pulverizing clinker, consisting essentially of crystalline hydraulic calcium silicates, and usually containing one or more of the following: water, calcium sulfate, up to 5 % limestone, and processing additions.

portland-cement clinker, *n*—a clinker, partially fused by pyroprocessing, consisting predominantly of crystalline hydraulic calcium silicates.

pozzolan, *n*—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 cementitious hydrates.

saturated-lime water, *n*—see **lime-saturated water**.

slag cement, *n*—granulated blast-furnace slag that has been ground to cement fineness, with or without additions, and that is a hydraulic cement.

standardization, *n*—*of measuring instrument*, a process that, under specified conditions and following a standard procedure, establishes: (1) the relationship between the quantity values provided by reference standards or reference materials and the corresponding indications from a measuring instrument or system; or (2) the adjustment to be applied to test equipment when its performance is compared to that of an accepted standard or process.

DISCUSSION—Standardization in case (1) is a simplified form of calibration that accounts for systematic error (bias) but does not evaluate random error. Standardization, therefore, does not address all of the elements of uncertainty of measurement and does not lead to traceable measurements. An example of case (2) standardization is adjusting the number of blows of a mechanically-operated hammer so it applies the same energy as a specified number of blows of a manually-operated hammer.

stucco, *n*—a hydraulic cement plaster containing fine aggregate, used for coating exterior surfaces.

5. Keywords

5.1 cement terminology; definitions; hydraulic cement terminology; terminology; terms

SUMMARY OF CHANGES

Committee C01 has identified the location of selected changes to this standard since the last issue (C219 – 14) that may impact the use of this standard. (Approved August 1, 2014.)

(1) Added definitions and associated discussions for the terms
calibration and *standardization*.

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