



Designation: C219 – 19a

# Standard Terminology Relating to Hydraulic and Other Inorganic Cements<sup>1</sup>

This standard is issued under the fixed designation C219; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

## 1. Scope\*

1.1 This terminology defines terms relating to hydraulic and other inorganic 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[C11 Terminology Relating to Gypsum and Related Building Materials and Systems](#)

[C51 Terminology Relating to Lime and Limestone \(as used by the Industry\)](#)

[C114 Test Methods for Chemical Analysis of Hydraulic Cement](#)

[C114 Test Methods for Chemical Analysis of Hydraulic Cement](#)

[C125 Terminology Relating to Concrete and Concrete Aggregates](#)

[C294 Descriptive Nomenclature for Constituents of Concrete Aggregates](#)

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

Current edition approved Nov. 15, 2019. Published November 2019. Originally approved in 1948. Last previous edition approved in 2019 as C219 – 19. DOI: 10.1520/C0219-19A.

<sup>2</sup> 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.

[C595/C595M Specification for Blended Hydraulic Cements](#)  
[C1328/C1328M Specification for Plastic \(Stucco\) Cement](#)  
[C1329/C1329M Specification for Mortar Cement](#)

2.2 *ACI Standard:*

[ACI 116R Cement and Concrete Terminology](#)<sup>3</sup>

## 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.

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

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

**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

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

\*A Summary of Changes section appears at the end of this standard

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 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** ( $\text{CaSO}_4$ ), **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**,  $\text{Na}_2\text{O}_{\text{eq}}$ , *n*—in hydraulic cement, a value determined by reporting sodium and potassium oxides from chemical analysis using the formula:

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

DISCUSSION— $\text{Na}_2\text{O}_{\text{eq}}$  is used to provide a single value describing the level of alkalis in a material. The value 0.658 is the molar mass ratio of  $\text{Na}_2\text{O}$  to  $\text{K}_2\text{O}$ . In common practice, the values of sodium oxide and potassium oxide used to calculate equivalent alkali content are based on determinations of total alkalis, unless noted otherwise in individual standards. Alkali equivalent, soda equivalent, and sodium equivalent are deprecated terms.

*equivalent alkalis, total*—equivalent alkalis based on determination of total alkalis using procedures in Test Methods C114.

*equivalent alkalis, water-soluble*—equivalent alkalis based on determination of water-soluble alkalis using procedures in Test Methods C114.

**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.