



Standard Specification for Pozzolanic Blended Materials in Construction Applications¹

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1. Scope

1.1 This specification covers pozzolanic blended material for use in construction applications where the properties normally attributed to coal fly ash and raw or calcined pozzolans, like silica fume, and slag cement.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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

[C25 Test Methods for Chemical Analysis of Limestone, Quicklime, and Hydrated Lime](#)

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

[C219 Terminology Relating to Hydraulic Cement](#)

[C311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete](#)

[C593 Specification for Fly Ash and Other Pozzolans for Use With Lime for Soil Stabilization](#)

[C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete](#)

[C989 Specification for Slag Cement for Use in Concrete and Mortars](#)

[C1240 Specification for Silica Fume Used in Cementitious Mixtures](#)

2.2 *EPA Standard:*³

[EPA 9060 Total Organic Carbon](#)

¹ This specification is under the jurisdiction of ASTM Committee D34 on Waste Management and is the direct responsibility of Subcommittee D34.03 on Treatment, Recovery and Reuse.

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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 United States Environmental Protection Association (EPA), Ariel Rios Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *cement kiln dust*—the finely divided particulate matter carried from a cement kiln by the exhaust gases.

3.1.2 *pozzolanic blended material*—a pozzolan resulting from the intimate and uniform blend of two or more finely divided materials.

3.2 *Definitions*—Other terms used in this specification are defined in Terminologies C125 or C219 or Specifications C618, C989, and C1240.

4. Classification

4.1 The types of pozzolanic blended materials covered by this specification are an intimate and uniform blend of two or more of the following materials: Type F – Class F fly ash; Type C – Class C fly ash; Type CKD – Cement kiln dust; Type S – ground granulated blast furnace slag; Type SF – Silica fume; Type M – Metakaolin.

4.2 The pozzolanic blended material shall be labeled in order of highest mass of materials. For example, a 60 % by mass Class F fly ash with 30 % by mass slag and 10 % by mass cement kiln dust would be termed Type FSCKD.

5. Ordering Information

5.1 Include the following information in orders for blended pozzolan meeting the requirements of this specification:

5.1.1 The specification designation ASTM Specification D5370,

5.1.2 The specification date, if other than the latest published version,

5.1.3 The quantity of blended pozzolan desired, and the classification desired,

5.1.4 A statement as to specific requirements or intended use of the blended pozzolan, and

5.1.5 Request for the manufacturers certification, if desired.

6. Materials and Manufacturer

6.1 The pozzolanic blended material is the result of an intimate and uniform blend.

NOTE 1—The attainment of an intimate and uniform blend of two types of fine material is difficult. Consequently, adequate equipment and controls must be provided by the manufacturer. The purchaser should

ensure himself of the adequacy of the blending operation. See [Appendix X1](#) for the procedure.

NOTE 2—Certain raw materials like fly ash and cement kiln dust, which blends are covered by this specification, vary from source to source, as well as within sources.

7. Blended Pozzolan for Use with Lime⁴

7.1 Ensure that blended pozzolan conforms to the requirements prescribed in Specification [C593](#).

8. Blended Pozzolan for Use in Concrete⁵

8.1 Ensure that blended pozzolan conforms to the chemical and physical requirements as prescribed in the tables of Specification [C618](#). The purchaser will specify the mineral admixture class (in Specification [C618](#)). Carbon may substitute for loss on ignition requirement. The percentage of carbon or loss on ignition is determined by the procedure in the section on test methods.

9. Sampling

9.1 Sample the blended pozzolan in accordance with the requirements of Test Methods [C311](#).

10. Test Methods

10.1 *Blended Pozzolans for Use With Lime*—Use test methods as required in Specification [C593](#).

10.2 *Blended Pozzolans for Use in Concrete*—Use test methods as required in Test Methods [C311](#) with the following exception:

10.2.1 *Determination of Loss on Ignition (Corrected for CO₂) of Type FCKD Blended Pozzolan*—This test method corrects for the presence of carbon dioxide. Ignite the oven-dried blended pozzolan in a muffle furnace at a controlled temperature. Determine total loss on ignition according to Test Methods [C311](#) except use platinum crucibles and ignite at a temperature of $950 \pm 50^\circ\text{C}$. Calculate total loss on ignition according to Test Methods [C311](#). The total loss in weight is assumed to be CO₂, C, and any chemically combined water.

10.2.1.1 Determine carbon dioxide on an oven-dried sample of blended pozzolan according to Test Methods [C25](#). Some blended pozzolans may have negligible amounts of carbon dioxide.

10.2.1.2 Report loss on ignition (corrected for CO₂) for blended pozzolan as the difference between total loss on ignition and carbon dioxide. Thus, the percentage loss on ignition (corrected for CO₂) = the percentage total loss on ignition minus percentage carbon dioxide.

10.2.2 Determination of carbon (corrected for CO₂) in blended pozzolan is an acceptable alternative to loss on ignition (corrected for CO₂).

10.2.2.1 Determine total carbon on an oven-dried sample of blended pozzolan according to Test Methods [C25](#).

⁴ *Kiln Dust Fly Ash Systems for Highway Bases and Subbases*, U.S. Department of Transportation-Report #FHWA/RD/167, 1982.

⁵ *Evaluation of Kiln Dust as in Concrete*, Proceedings of Second International Conference in Madrid on Fly Ash, Silica Fume, Slag, Natural Pozzolans in Concrete, V. Ramakrishnan, ed. Vol 1, 1986.

10.2.2.2 Determine carbon dioxide on an oven-dried sample of blended pozzolan according to Test Methods [C25](#). Report carbon corrected for CO₂ for blended pozzolan as the difference between total carbon and carbon dioxide. Thus, the percentage carbon (corrected for CO₂) = the percentage total carbon – (CO₂ × 0.273).

10.2.3 Determine non-carbonate carbon using test method EPA 9060.

11. Storage and Inspection

11.1 Store the blended pozzolan in such a manner as to permit easy access for proper inspection and identification of each shipment. The purchaser shall have access to every facility for careful sampling and inspection, either at the source or at the site of the work as may be specified by the purchaser.

12. Rejection

12.1 Material that fails to conform to the requirements of this specification may be rejected. Report rejection to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

12.2 Packages more than 2 % below the weight marked thereon, may be rejected; and if the average weight of the packages in any shipment, as shown by weighing 50 packages taken at random, is less than that marked on the packages, the entire shipment may be rejected.

12.3 Blended pozzolan remaining in storage for a period greater than 6 months after completion of the tests may be retested and may be rejected if it fails to conform to any of the requirements of this specification.

13. Certification

13.1 When specified in the purchase order or contract, furnish the purchaser certification that samples representing each lot have been tested or inspected as directed in this specification and the requirements of this specification have been met.

13.1.1 When specified in the purchase order or contract, furnish a report of the test results that contain the results of chemical analysis of the blended pozzolan to provide the purchaser the composition of the material. Include in that analysis: loss on ignition or carbon (corrected for CO₂), moisture, SiO₂, Al₂O₃, Fe₂O₃, CaO, MgO, Total Na₂O, Total K₂O, and SO₃.

14. Manufacturer's Statement

14.1 The manufacturer will state, in writing, the nature of physical and chemical changes in the pozzolanic blended material since last purchased. Any changes in sources of raw material or in proportions of those raw materials will be reported to the purchaser or user. If requested, test data will be supplied indicating specification compliance.

15. Packaging and Package Marking

15.1 Plainly mark the class of the blended pozzolan, name and brand of the producer, and the mass of the material

contained therein on each package when the blended pozzolan is delivered in packages. Provide similar information in the shipping documents accompanying the shipment of packaged or bulk blended pozzolan.

16. Keywords

16.1 cement kiln dust; fly ash; lime kiln dust; pozzolan; pozzolanic blended material

APPENDIX

(Nonmandatory Information)

X1. QUALITY ASSURANCE PROGRAM: ADEQUACY OF THE BLENDING PROCESS AT THE PRODUCTION FACILITY

X1.1 A blend of two ingredients of different absolute densities should result in a known reproducible density for each proportion. For example, a uniform blend of 80 % fly ash (density = 2.27) and 20 % kiln dust (density = 2.9) should result in a density within 5 % of the theoretical density. Take three random samples after the blending process has been completed and determine the densities of each.

X1.2 To complete the testing for blending uniformity, one can determine the distribution of a very small quantity of admixture within the products. Add fluorescein to the batch (for example, add 30 g fluorescein to a 5-lb bag of material,

mix, and add the bag to the 12-ton batch) and after the blending process is completed. The concentration of fluorescein in the batch, as measured by spectrophotometric technique, should be 95 to 105 % of theoretical.

X1.3 The exact blending process must be in the QA report including batch weights, blending times, blending procedure, and other pertinent data.

X1.4 The check for the uniformity of the blend should be performed on a monthly basis or each time the blending process varies (equipment, blending time, weights, and so forth).

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