



Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete¹

This standard is issued under the fixed designation C 311; 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 reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 These test methods cover procedures for sampling and testing fly ash and raw or calcined pozzolans for use in portland-cement concrete.

1.2 The procedures appear in the following order:

	Sections
Sampling	7
CHEMICAL ANALYSIS	
Reagents and apparatus	10
Moisture content	11 and 12
Loss on ignition	13 and 14
Silicon dioxide, aluminum oxide, iron oxide, calcium oxide, magnesium oxide, sulfur trioxide, sodium oxide and potassium oxide	15
Available alkali	16 and 17
PHYSICAL TESTS	
Density	18
Fineness	19
Increase of drying shrinkage of mortar bars	20 to 22
Soundness	23
Air-entrainment of mortar	24 and 25
Strength activity index with portland cement	26 to 29
Water requirement	30
Effectiveness of Fly Ash or Natural Pozzolan in Controlling Alkali-Silica Reactions	31
Effectiveness of Fly Ash or Natural Pozzolan in Contributing to Sulfate Resistance	33

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

1.4 *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.*

1.5 The text of this standard references notes and footnotes that provide explanatory information. These notes and footnotes (excluding those in tables) shall not be considered as requirements of this standard.

2. Referenced Documents

2.1 ASTM Standards:

- C 33 Specification for Concrete Aggregates²
- C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)³
- C 114 Test Methods for Chemical Analysis of Hydraulic Cement³
- C 150 Specification for Portland Cement³
- C 151 Test Method for Autoclave Expansion of Portland Cement³
- C 157/C 157M Test Method for Length Change of Hardened Hydraulic Cement, Mortar, and Concrete²
- C 185 Test Method for Air Content of Hydraulic Cement Mortar³
- C 188 Test Method for Density of Hydraulic Cement³
- C 204 Test Method for Fineness of Hydraulic Cement by Air Permeability Apparatus³
- C 226 Specification for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Hydraulic Cement³
- C 227 Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)²
- C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency³
- C 430 Test Method for Fineness of Hydraulic Cement by the 45- μ m (No. 325) Sieve³
- C 441 Test Method for Effectiveness of Mineral Admixtures or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction²
- C 618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete²
- C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials²
- C 778 Specification for Standard Sand³
- C 1012 Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution³
- C 1157 Performance Specification for Hydraulic Cement³

¹ These test methods are under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and are the direct responsibility of Subcommittee C09.24 on Supplementary Cementitious Materials.

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² Annual Book of ASTM Standards, Vol 04.02.

³ Annual Book of ASTM Standards, Vol 04.01.