
Standard Specification for Slag Cement for Use in Concrete and Mortars

AASHTO Designation: M 302-24

Technically Revised: 2024

Editorially Revised: 2024

Technical Subcommittee: 3a, Cement, Lime, and Concrete Materials

ASTM Designation: C989/C989M-24



**American Association of State Highway and Transportation Officials
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1.

SCOPE

- 1.1.
- This specification covers slag cement for use as a cementitious material in concrete and mortar.
- 1.2.
- The values stated in SI units are to be regarded as standard. The values given in parentheses are given for information only.
- 1.3.
- The following safety hazards caveat pertains only to the test methods described in this specification. 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.*
- 1.4.
- The text of this standard references notes that provide explanatory information. These notes and footnotes (excluding those in tables) shall not be considered as requirements of this standard.
Note 1—The material described in this specification may be used to produce a blended cement meeting the requirements of M 240M/M 240 or as a separate ingredient in concrete or mortar mixtures. The material may also be useful in a variety of special grouts and mortars and, when used with an appropriate activator, as the principal cementitious material in some applications.
Note 2—Information on technical aspects of the use of the material described in this specification is contained in Appendix X1, Appendix X2, and Appendix X3. More detailed information on that subject is contained in ACI 233R.

2.

REFERENCED DOCUMENTS

- 2.1.
- AASHTO Standards:*
 - M 85, Portland Cement
 - M 240M/M 240, Blended Hydraulic Cement
 - R 80, Determining the Reactivity of Concrete Aggregates and Selecting Appropriate Measures for Preventing Deleterious Expansion in New Concrete Construction
 - T 105, Chemical Analysis of Hydraulic Cement
 - T 106M/T 106, Compressive Strength of Hydraulic Cement Mortar (Using 50-mm or 2-in. Cube Specimens)
 - T 133, Density of Hydraulic Cement
 - T 137, Air Content of Hydraulic Cement Mortar
 - T 153, Fineness of Hydraulic Cement by Air Permeability Apparatus
 - T 192, Fineness of Hydraulic Cement by the 45-µm (No. 325) Sieve

- 2.2. *ASTM Standards:*
- C125, Standard Terminology Relating to Concrete and Concrete Aggregates
 - C465, Standard Specification for Processing Additions for Use in the Manufacture of Hydraulic Cements
 - C1012/C1012M, Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
 - C1038/C1038M, Standard Test Method for Expansion of Hydraulic Cement Mortar Bars Stored in Water
 - D3665, Standard Practice for Random Sampling of Construction Materials
- 2.3. *American Concrete Institute Report:*
- 233R, Guide to the Use of Slag Cement in Concrete and Mortar¹

3. TERMINOLOGY

- 3.1. *Definitions:*
- 3.1.1. *blast-furnace slag*—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. (See ASTM C125.)
- 3.2. *Descriptions of Terms Specific to This Standard:*
- 3.2.1. *granulated blast-furnace slag*—the glassy granular material formed when molten blast-furnace slag is rapidly chilled as by immersion in water. (See ASTM C125.) Compositional adjustments may be made while the blast-furnace slag is molten.
- 3.2.2. *slag cement*—granulated blast-furnace slag, as defined and described in Sections 3.1.1 and 3.2.1 and ground to cement fineness with or without additions meeting the requirements of the section on additions.

4. CLASSIFICATION

- 4.1. Slag is classified by performance in the slag activity test in three grades: Grade 80, Grade 100, and Grade 120. (See Table 1.)

5. ORDERING INFORMATION

- 5.1. The purchaser shall specify the grade slag desired and the optional chemical or physical data to be reported.

6. ADDITIONS

- 6.1. *The slag cement covered by this specification shall contain no additions except as follows:*
- 6.1.1. It is permissible to add calcium sulfate to slag cement provided it has been demonstrated by ASTM C1038/C1038M that a test mixture will not develop expansion in water exceeding 0.020 percent at 14 days. In the test mixture, 50 percent of the mass of portland or portland–limestone cement shall be replaced by an equal mass of slag cement. The cement used in the test mixture shall meet the requirements of M 85 Type I or Type II, or M 240 Type IL. When the

manufacturer supplies cement under this provision, upon request, supporting data shall be supplied to the purchaser.

- 6.1.2. Processing additions may be used in the manufacture of the slag cement, provided such materials, in the amounts used, have been shown to meet the requirements of ASTM C465 when tested using a blend that is 50 percent slag cement and 50 percent portland or portland–limestone cement by mass.

7. PHYSICAL PROPERTIES

- 7.1. Slag cement shall conform to the physical requirements of Table 1.

Table 1—Physical Requirements

Item		
Fineness:		
Amount retained when wet-screened on a 45-µm (No. 325) sieve, max percent		20
Specific surface by air permeability, Method T 153 shall be determined and reported although no limits are required		—
Air content of slag cement mortar, max percent		12

Slag Cement Activity Index	Average of Last 5 Consecutive Samples	Any Individual Sample
28- or 56 ^b -Day index, Min, Percent:		
Grade 80	75	70
Grade 100	95	90
Grade 120	115	110

^a 7-Day Slag Activity Index shall be determined on Grades 100 and 120 and reported for informational purposes.

^b Only applicable when testing at 56 days is specified.

8. CHEMICAL COMPOSITION

- 8.1. Slag cement shall conform to the chemical requirements prescribed in Table 2.

Table 2—Chemical Requirements

Sulfide sulfur (S), max percent	2.5
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Note 3—Sulfur in slag cement is present predominantly as sulfide sulfur. In most cases, instrumental analyses, such as x-ray fluorescence, cannot differentiate sulfide sulfur from sulfate. Determine and report the sulfide sulfur content separately and do not include it in the SO₃ calculations.