SCA SLAG CEMENT ASSOCIATION

Information Sheets

12: Terminology and Specifications

Terminology

Slag cement (Ground-granulated blast-furnace slag): A hydraulic cement formed when granulated blast-furnace slag is ground to a suitable fineness.

Granulated blast-furnace slag: The glassy, granular material formed when molten blast-furnace slag is rapidly chilled as by immersion in water. Also referred to as granules.

Blast-furnace slag: The non-metallic product, consisting essentially of silicates and aluminosilicates of calcium and other bases, which is developed in a molten condition simultaneously with iron in a blast-furnace.

Blast-furnace: A furnace used to reduce raw materials into molten iron. Combustion is forced with pressurized air.

Binary blended cement: a blended hydraulic cement consisting of portland cement with either a slag, a pozzolan, or a limestone.

Ternary blended cement: a blended hydraulic cement consisting of portland cement with either a combination of two different pozzolans, slag, and a pozzolan, a pozzolan, and a limestone, or a slag and a limestone.

Air-cooled blast-furnace slag: The material resulting from the solidification of molten blast-furnace slag under atmospheric conditions. Subsequent cooling may be accelerated by application of water to the solidified surface. (This material can be mined and crushed for use as aggregate in concrete or fill material, but is not cementitious.)

Expanded blast-furnace slag: The light weight cellular material obtained by controlled processing of molten blast-furnace slag with water, or water and other agents, such as steam or compressed ai. or both. (This is commonly used as lightweight aggregate and is not cementitious.)

Portland cement: A hydraulic cement produced by pulverizing portland-cement clinker and usually containing calciu. sulfate.

Portland-limestone cement: a type of blended cement with a higher limestone content than straight portland cement

Blended cement: A hydraulic cement produced by inter-grinding portland cement clinker with other materials, or by blending portland cement with other materials, or by a combination of inter-grinding and blending.

Portland blast-furnace slag cement: A blended cement consist- ing of an intimately interground mixture of portland cement clinker and granulated blast-furnace slag or an intimate and uniform blend of portland cement and fine granulated blast-furnace slag in which the amount of the slag constituent is within specified limits.

Hydraulic cement: A cement that sets and hardens by chemical interaction with water and is capable of doing so under water.

Pozzolan: 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 compounds possessing cementitious properties.

Glass: An inorganic product of fusion, which has cooled to a rigid condition without crystallization.

Specifications: *Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars*—ASTM C989/C989M-22[1]

This specification covers three grades (grades 80, 100, and 120) of finely ground granulat- ed blast-furnace slag for use as a cementitious material in concrete and mortar. The material described in this specification can be used for blending with portland cement to produce a cement meeting the requirements of Specification C595/C595M; or 2) as a separate ingre- dient in concrete and mortar mixtures. The material may also be useful in a variety of grouts an. mortars.

Standard Specification for Blended Hydraulic Cements—ASTM C595/C595M-21[2]

This specification pertains to five classes of blended hydraulic cement for both general and special applications, using slag cement, or a pozzolan or both, with portland cement, or portland cement clinker or slag with limestone. This specification prescribes ingredients proportions, and testing requirements. The two most common types of binary blended cement using slag cement are:

- Type IS—Portland blast-furnace slag cement (in which slag constituent is between 25% and 70% by mass)
- Type I(SM)—Slag-modified portland cement (in which slag constituent is less than 25%)

Standard Performance Specification for Hydraulic Cement— ASTM C1157/C1157M-20a[3]

This specification covers hydraulic cements for both general and special applications. It is a specification that defines performance requirements for cement and does not restrict the composition of the cement or its constituents. The specification classifies cements, based on specific requirements for general use, high early strength, resistance to attack by sulfates, and heat of hydration.

Optional requirements are provided for the property of low reactivity with alkali-silica-reactive aggregates and for air-entraining cements.

Ground Granulated Blast-Furnace Slag as a Cementitious Constituent in Concrete[4] (Reported by ACI Committee 233)

This report primarily addresses the use of slag cement as a separate cementitious material added along with portland cement or portland-limestone cement in the production of concrete. Other slags derived from the smelting of materials other than iron ores are not discussed in this report. The reader should be aware that the material characteristics described in this report and the recommendations for use pertain solely to slag cement and not other forms or types of slag.

Specifications for Structural Concrete[5] (Reported by ACI Committee 301)

This specification is a reference standard which the engineer or architect can make applicable to any building project by citing it in the project specifications. The user supplements it as needed by designating individual project requirements. The document covers materials and proportioning of concrete; reinforcing and prestressing steels; production, placing, and curing of concrete; and formwork design and construction. Methods of treatment of joints and embedded items, repair of surface defects and finishing of formed surfaces are specified. Separate chapters are devoted to

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Modern concrete often includes the use of supplementary cementitious materials (SCMs). These materials are ofte. co-products of other processes or natural materials.

slab construction and finishing, architectural concrete, mass concrete and materials and methods for constructing post-tensioned concrete. Provisions governing testing, evaluation and acceptance of concrete, as well as for acceptance of the structure, are included.

Building Code Requirements for Structural Concrete[6] (Reported by ACI Committee 318)

The code portion of this document covers the proper design and construction of structural and plain concrete for buildings. The code has been written in such form that it may be adopted by reference in a general building code. Among the subjects covered are: drawings and specifications; inspection; materials; durability requirements; concrete quality, mixing, and placing; formwork; embedded pipes and construction joints; analysis and design; strength and serviceability; flexural and axial loads; shear and torsion; slab systems; walls; footings; precast concrete; composite flexural members; and prestressed concrete.

References

1. ASTM C989/C989M-22, "Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars," ASTM International, West Conshohocken, PA, 2003 (Last updated Aug. 29, 2022)

2. ASTM C595/C595M-21, "Standard Specification for Blended Hydraulic Cements," ASTM International, West Conshohocken, PA, 2003. (Last updated June 291, 2022)

3. ASTM C1157/C1157M-20a, "Standard Performance Specification for Hydraulic Cement," ASTM International, West Conshohocken, PA, 2003. (Last updated Jan 29, 2021)

4. ACI 233R-95, "Ground Granulated Blast-Furnace Slag as a Cementitious Constituent in Concrete," American Concrete Institute, Farmington Hills, MI, 1995.

5. ACI 301-99, "Specifications for Structural Concrete," American Concrete Institute, Farmington Hills, MI. 1999.

6. ACI 318-02, "Building Code Requirements for Structural Concrete," American Concrete Institute, Farmington Hills, MI, 2002.