SLAG CONCRETE MASONRY

MANUFACTURER

Locations of blast furnace slag aggregates for concrete and concrete masonry construction can be contacted by visiting www.phxslag.com.

PRODUCT DESCRIPTION

Composition: Blast furnace slag used in concrete masonry units is the non-metallic product developed simultaneously with iron in a blast furnace. Three types are available for use in the manufacture of concrete masonry units: expanded slag, a lightweight cellular aggregate produced by treating molten slag with water and/or steam and compressed air; air-cooled slag, produced by slower cooling under atmospheric conditions; and granulated slag, produced by quenching the molten slag in water. (See ASTM C 125 for detailed definitions.)

Basic Use: Concrete masonry units are used in all types of interior and exterior wall construction.

Limitations: Concrete masonry units, made with any type of aggregate, should be waterproofed by approved methods when used in exterior walls below grade. Protective coatings may be desirable on exterior wall above grade, dependent upon local experience and the manufacturer's recommendations.

Sizes and Shapes: Slag concrete masonry units are made in a wide variety of sizes and shapes to fit different construction uses. Details on dimensions of many of the dozens of standard modular sizes and shapes may be found in the Portland Cement Association's "Concrete Masonry Handbook" and the National Concrete Masonry Association's bulletin "Concrete Masonry Construction Details." Manufacturers can supply a schedule of sizes and shapes available locally.

Color: Slag concrete masonry units are typically a light gray to white in color. The color will vary somewhat depending upon color characteristics of the cementitious materials used, effects of admixtures or plasticizers, and curing procedures. Specially colored units can be made by adding appropriate mineral colors to the block mixtures.

Texture: Wide variations in surface texture from a coarse, open surface to fine, close textured units, can be produced by the proper selection, grading and proportioning of the aggregates.
Textures in popular usage vary between different areas of the country and can be modified to obtain desired architectural effects.

Applicable Standards:
Slag concrete masonry units are manufactured to meet the

requirements of ASTM specifications C-90-Hollow Load-bearing Concrete Masonry Units, C-145-Solid Load-bearing Concrete Masonry Units, and C-55Concrete Building Brick; and of the Corps of Engineers Guide Specifications for Military and Civil Works Construction- Masonry-CE 206.01. In Canada, slag units meet the corresponding requirements of C.S.A. standards A 165.1.2.3.4.

TECHNICAL DATA

Strength: The compressive strength of concrete masonry units is ordinarily specified on the basis of the gross cross sectional area of the units including all core space in the hollow units. The following strength values are adequate for all normal designs and uses and represent the minimums which slag units are manufactured to meet.

Table 1. Minimum Compressive Strengths

Type of Unit	Gross Area Compressive Strength Minimum tpsi (ASTM Method C 1_0) Average of 5 Units	Individual Unit
Hollow load-bearing (ASTM C 90)	1,000*	900
Solid load-bearing (ASTM C 145	1,800	1.500
Concrete brick (ASTM C 55)	2,500	2.000

Requirements may be reduced to 700 psi average and 600 psi for individual units when use is restricted to interior or protected walls.

Weight: The weight of slag concrete masonry units varies with type, weight, and gradation of the slag used, dimensions of the unit and volume of core space, cement content, and density or compaction of the concrete. Typical weights of hollow 8”x8”xl6” modular units are in the following ranges: Expanded slag - 25-33 lb. Air-cooled slag - 35-43 lb. Granulated slag - 28-35 lb.

Absorption: This characteristic is probably of little importance in concrete masonry specifications since it has no demonstrated correlation with other desirable properties and is dependent to a large degree on concrete composition and compaction and texture of the units. Slag units conform to standard specification requirements.

Shrinkage: The drying shrinkage of concrete masonry units is an important consideration in design, since the associated volume changes affect the requirements for control joints and reinforcement necessary to prevent cracking. Type of aggregate is a major factor in determining shrinkage, which is also influenced by mix design and curing methods. Several studies have shown that slag concrete masonry units have low drying shrinkages.

Table 2. Drying Shrinkage of Slag Concrete Masonry Units. (ASTM Method C 426-58T)

Slag Type	Steam Curing Method	Shrinkage Percent	Laboratory
Expanded	Low Pressure	0.036	Law Engr. Testing Co.
Expanded	Low Pressure	0.035	Freehling & Robertson
Expanded	High Pressure	0.021	National Slag Assn.
Expanded	High Pressure	0.013	U of Toledo Research Foundation
Air-cooled	Low Pressure	0.036	National Slag Assn.
Air-cooled	Low Pressure	0.020	U of Toledo Research Foundation

Data from Table XI, “Slag Concrete Masonry Units,” National Slag Association.

Fire Resistance and Thermal Insulation: The concrete masonry units made with slag aggregates have low thermal conductivities. As a result, the slag units have better insulating properties and fire resistance for a given thickness of solid material in a wall than do many of the other

aggregates. Table 3 shows estimated fire ratings of walls and partitions of concrete masonry units made with various types of aggregates. The equivalent thicknesses shown for the ratings are from “Fire Resistance Ratings,” National Board of Fire Underwriters, December, 1964, and are for walls with no combustible members framed in them.

Acoustical Properties: Slag concrete masonry units have been used very effectively to control sound in buildings. The texture and internal void characteristics of the units have a great effect on both the sound absorption characteristics and the reduction in sound transmission through the walls.

Table 3. Fire Resistance of Concrete Masonry Units

Type of Aggregate	Minimum Equivalent Thickness, Inches, for ratings of			
	4 hrs.	3 hrs.	2 hrs.	1 hr.
Expanded slag or pumice	4.7	4.0	3.2	2.1
Expanded clay or shale	5.7	4.8	3.8	2.6
Limestone, cinders or unexpanded slag	5.9	5.0	4.0	2.7
Calcareous gravel	6.2	5.3	4.2	2.8
Siliceous gravel	6.7	5.7	4.5	3.0

Equivalent thickness is the average thickness of the solid material in the wall. Average slag concrete masonry units may be expected to have sound absorption values of 0.40 to 0.60 and sound reduction factors of 45 decibels or more.

INSTALLATION

Methods: Standard masonry construction procedures. The “Concrete Masonry Handbook” by the Portland Cement Association, and “Concrete Masonry Construction Details” prepared by the National Concrete Masonry Association contain extensive and useful information on construction procedures and details applicable to all concrete masonry - construction.

Building Codes: American Standard Building Code Requirements for Masonry (A 41.1) or appropriate local codes.

AVAILABILITY AND COST

Availability: Locations of Phoenix Services sites can be found on the company website in the “Slag Sales” section. The contact information for the slag sales representatives is included on the individual site section. Blast furnace slag is not available at all Phoenix Services sites.

Cost: Information can be obtained from producers in the individual project area.

GUARANTEES

Certification of compliance with standard specifications such as those of ASTM is often available, but individual manufacturers should be contacted for specific information.

MAINTENANCE

No special maintenance is required for slag concrete masonry units. As with any material, periodic painting or cleaning of walls may be desirable, depending upon use and exposure.

TECHNICAL SERVICES

Technical assistance in the proper application of slag in base courses and additional information on properties and characteristics are available on request through the National Slag Association website (www.nationalslag.org).

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