



## SECTION 1017

### GROUND GRANULATED BLAST FURNACE SLAG

**1017.1 Scope.** This specification covers ground Granulated Blast Furnace Slag (GGBFS) for use in Portland cement concrete.

**1017.2 General.** All GGBFS shall be in accordance with AASHTO M 302, Grade 100 or 120, except as herein specified. Only GGBFS from sources qualified in accordance with these specifications will be permitted.

**1017.2.1** GGBFS may only be used with AASHTO M 85, Type I or Type II Portland cement, unless otherwise directed by the engineer.

**1017.2.2** The mixing of different grades and sources of GGBFS will not be permitted.

**1017.2.3** The term "manufacturer", as used in this specification, will be the company grinding the granulated blast furnace slag to produce GGBFS. The term "marketing entity", as used in this specification, will be the supplier or broker of the GGBFS. The marketing entity will be responsible for complying with these specifications.

**1017.2.4** All tests shall be performed in a MoDOT approved laboratory.

**1017.3 Sampling, Testing and Acceptance Procedures.** All marketing entities and terminals furnishing GGBFS to MoDOT projects shall be qualified as herein described. All GGBFS will be subject to inspection and sampling by MoDOT at the source of manufacture, an intermediate shipping terminal or destination. MoDOT shall be allowed unlimited access to all facilities and records as required to conduct inspection and sampling.

**1017.3.1 Marketing Entity Qualification.** In order to become qualified, a written request shall be sent by the marketing entity to Construction and Materials, along with a copy of the marketing entity's QC plan. The production source and terminals may be inspected to verify the information and to establish personal contact with the QC personnel.

**1017.3.1.1** The following information shall be included in the request for qualification:

(a) An outline of the QC program from the source of manufacture to the point where the product is relinquished to the purchaser. The QC program shall cover all tests in accordance with the specification and include the testing frequency for each test. The name of the testing laboratory shall be included. Each sample shall not represent less than 500 tons (500 Mg).

(b) A copy of the testing laboratory's most recent Cement and Concrete Reference Laboratory (CCRL) inspection report and the latest CCRL proficiency sample report. The CCRL inspection shall cover all tests in accordance with the specification. Documentation showing satisfactory resolution of all inspection deficiencies shall be included.

(c) Complete name and address of the GGBFS source and owner. If located in an area without precise address identification, a complete map description shall be furnished. If more than one source is used, all sources shall be listed.

(d) Grade of GGBFS produced.

(e) Description of storage facilities, including capacities, set-aside capabilities and sampling method(s).

(f) A copy of a typical bill of lading with the required certification statement.

(g) A split sample of the GGBFS proposed for use, obtained over a minimum of one production day. The marketing entity's test results for the split sample shall also be submitted. The marketing entity shall provide reference cement if the cement used is unavailable to the area.

**1017.3.1.2** In order to maintain qualification, the following will be required:

(a) QC test results covering the production of all GGBFS proposed for use in MoDOT projects, including the high, low and average results shall be kept on file by the marketing entity. Sampling and testing shall be in accordance with these specifications.

(b) A sample shall be tested for each 2000 tons (2000 Mg) intended for use. The sample shall be tested by the marketing entity for fineness, No. 325 (45  $\mu\text{m}$ ) sieve analysis and Blaine, air content, 7-day and 28-day Slag Activity Index, percent sulfide sulfur (S) and percent sulfate ion ( $\text{SO}_3$ ), taken from a composite sample representing each 2000 tons (2000 Mg) of GGBFS transported to the storage silo. The composite shall be comprised of a minimum of four samples, each representing not more than 500 tons (500 Mg). Automatic samplers may be used in lieu of the individual 500-ton (500 Mg) grab samples.

(c) A copy of the most recent CCRL inspection and proficiency sample reports and any deficiency resolutions shall be forwarded promptly to MoDOT.

(d) Semi-annual split samples for the class of approved GGBFS will be obtained by MoDOT for joint testing by the marketing entity. Marketing entity test results on the split samples shall be furnished to Construction and Materials when completed.

(e) All QC test results shall be available for a minimum of three years, for MoDOT review upon request.

(f) Only GGBFS in compliance with these specifications shall be allowed into a silo destined for MoDOT projects.

**1017.3.2 Terminal Qualification.** In order to become a qualified terminal, a written request shall be sent from terminal personnel to Construction and Materials. A letter shall accompany the request from each affected and qualified marketing entity, advising of the intent to ship through the respective terminal. Any changes in GGBFS sources shall be updated in the same manner. Terminals will be inspected to ensure adequacy to accept, retain and ship GGBFS from qualified marketing entities.

**1017.3.3 Failure to Comply.** Failure to fulfill any of these requirements may result in disqualification of the GGBFS manufacturer, marketing entity or terminal. In cases of dispute, test results obtained by MoDOT will control.

**1017.3.4 Disqualified Facilities.** If a facility has been disqualified, the marketing entity will be required to designate the silo, bin or storage facility from which the marketing entity proposes to furnish GGBFS for MoDOT projects. Each silo, bin or storage facility designated must be sampled, tested, sealed and approved by MoDOT prior to shipment. The marketing

entity shall also sample, test and report the test results for each designated silo, bin or storage facility. This procedure will continue until adequate QC has been established.

**1017.3.5 Shipping.** GGBFS continually sampled and tested via autosamplers at a location, frequency and duration acceptable to MoDOT, may be continuously shipped direct from a marketing entity. All GGBFS manually sampled and tested shall be held in the silo or bin until such time as the test results are completed prior to shipping.

**1017.3.6 Storage.** All GGBFS intended for use shall be sampled, tested and placed in a designated silo or bin.

**1017.4 Acceptance.** The marketing entity shall certify that the material complies with the specification requirements. When a qualified marketing entity or terminal is shipping GGBFS for, or purchasing GGBFS from, another qualified marketing entity, the bill of lading or delivery receipt shall be from the shipping company. The certification statement showing the actual manufacturer shall be prominently placed on the bill of lading or delivery receipt. A copy of the bill of lading or delivery receipt shall accompany each shipment and shall be furnished to MoDOT at the shipping and destination points.

**1017.4.1** The bill of lading or delivery receipt for each shipment to MoDOT projects shall carry the following certification statement:

"This is to certify this Grade \_\_\_\_ GGBFS originated from a MoDOT qualified manufacturer, has been maintained to meet MoDOT specifications and was loaded from silo number \_\_\_\_\_."

\_\_\_\_\_  
Name and Location of Manufacturer

\_\_\_\_\_  
Name and Location of Shipping Facility

By \_\_\_\_\_  
Signature and Name of Marketing Entity