CEMENT, GROUND GRANULATED BLAST FURNACE SLAG, AND BLENDED CEMENT CERTIFICATION

A list of certified cement and GGBFS sources are available on the Mn/DOT Concrete Engineering Unit website at www.mrr.dot.state.mn.us/pavement/concrete/products.asp.

I. General
Mn/DOT will only accept cementitious materials from certified sources.

Certification of any type of portland cement, blended cement, or GGBFS is based on testing of samples at the manufacturing plant, the distribution terminal, or at the port of entry with comparison sampling by Mn/DOT.

Only fly ash and GGBFS from certified sources are allowed for use in the manufacturing of blended cements. The Supplier shall provide proper documentation regarding each shipment of fly ash or GGBFS. See 5-694.116 for Fly Ash Certification. In manufacturing blended cement, the alkali content of the clinker shall not exceed the company’s quality control criteria used for regular Type I cement. If the fly ash or GGBFS is blended or inter-ground with the cement, the cement shall comply with the Specifications and the requirements stated in this procedure.

Mixing of portland cement, blended cements, or GGBFS from different sources or of different types in one storage bin or silo is NOT PERMITTED.

The Supplier shall empty cement storage bins at ready-mix plants, batch plants, and pre-cast production plants, as far as practicable, prior to refilling from a different source. The Supplier shall store and dispense blended cement from separate storage bins.

The system for managing the documentation of the inspection of cementitious material was developed with four main objectives.

1. Mn/DOT projects must receive cementitious materials from certified sources only.
2. The certified source shall have a Mill Test Report Program that is approved by Mn/DOT to verify the quality of the cementitious material. The program must have an adequate testing schedule using standard procedures. As strength is a major factor in a uniform quality control program, Mn/DOT requires regular cube strength test results to evaluate trends in the cementitious materials.
3. Quality control testing is done by the Producer to assure that the material meets certain standards, whereas the owner does acceptance or verification testing. Therefore, the Agency may check cementitious material arriving at a ready-mix, batch, or pre-cast production plant for project verification by the construction project personnel so that unsuitable cementitious materials are not incorporated into projects.
4. Timely record keeping provides the ability to certify the product at the manufacturing plant or the distribution terminal, then track the product from the point of certification to the ready-mix plant, batch plant or pre-cast production plant.
To make this system work, the manufacturer, distributor, and concrete producer must maintain records of dates that the product is manufactured, dates the product is shipped and received at various locations, and a Mill Test Report that corresponds to the quantity shipped.

Final acceptance is based upon the use of cementitious material from certified sources and upon satisfactory test results from field verification samples from the cementitious material at the time of incorporation into the concrete.

II. Certification Procedures
Cement specifications and testing shall comply with Specification 3101 and AASHTO M 85.

Ground granulated blast furnace slag (GGBFS) shall comply with Specification 3102 and AASHTO M 302.

Blended cements shall comply with Specification 3103 and AASHTO M 240.

Acceptance is judged on the basis of time of set, false set, fineness, soundness, air content of the mortar, chemical analysis, and compressive strength. The slag activity index is also required for GGBFS.

Mn/DOT may require additional testing if these tests do not continuously meet the requirements. Mn/DOT may also require additional testing of the product prior to shipment due to special considerations on that project. When required, special testing provisions are stated in the Contract documentation for the project.

A. Cement, Ground Granulated Blast Furnace Slag, and Blended Cement Specifications and Testing

<table>
<thead>
<tr>
<th>AASHTO</th>
<th>ASTM</th>
<th>TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>T 106</td>
<td>C 109</td>
<td>Test Method for Compressive Strength of Hydraulic Cement Mortar</td>
</tr>
<tr>
<td>T 107</td>
<td>C 151</td>
<td>Test Method for Autoclave Expansion of Portland Cement</td>
</tr>
<tr>
<td>T 137</td>
<td>C 185</td>
<td>Test Method for Air Content of Hydraulic Cement Mortar</td>
</tr>
<tr>
<td>T 129</td>
<td>C 187</td>
<td>Test Method for Normal Consistency of Hydraulic Cement</td>
</tr>
<tr>
<td>T 131</td>
<td>C 191</td>
<td>Test Method for Time of Setting of Hydraulic Cement by Vicat Needle</td>
</tr>
<tr>
<td>T 153</td>
<td>C 204</td>
<td>Test Method for Fineness of Hydraulic Cement by Air Permeability Apparatus</td>
</tr>
<tr>
<td>T 154</td>
<td>C 266</td>
<td>Test Method for Time of Setting of Hydraulic Cement Paste by Gillmore Needles</td>
</tr>
</tbody>
</table>
B. Approved Laboratory
A laboratory is considered approved if it is properly equipped and staffed to perform the tests required for an acceptable quality control program. The Laboratory must participate in the Cement and Concrete Reference Laboratory (CCRL) or other program approved by the Mn/DOT Concrete Engineering Unit. A laboratory certification program is required.

C. Mill Test Report Program
The cement manufacturing plant or cement distribution terminal (certified source) shall submit to the Mn/DOT Concrete Engineer a copy of the proposed Mill Test Report Program. This program is submitted for approval, prior to certification, in writing to:

Mn/DOT Concrete Engineer
Mn/DOT Office of Materials
1400 Gervais Avenue
Maplewood, MN 55109

The Mill Test Report Program shall outline, as a minimum, the following:
- Sampling Procedures
- Testing Procedures
- Quantity of Cementitious for Mill Test
- Statement on Failing Test Procedures
- Proof of CCRL Laboratory participation or Mn/DOT Laboratory Approval
- The proposed (Mn/DOT - Certified Source) Companion Testing rate
- Laboratory Name and Location
- Source of GGBFS and Blast Furnace Plant Location

Address any variations from Mn/DOT Standard Specifications 3101, 3102, 3103, AASHTO, ASTM, or other standard methods or procedures.

The following minimum testing rates and procedures shall apply at the certified source:

1. Obtain a 2 kg (5 lb.) grab sample representing not more than 400 metric tons (tons) at the manufacturing plant or distribution terminal.
2. Obtain 1 composite sample representing not more than 4800 metric tons (tons) at the manufacturing plant or at the distribution center representing a given Mill Test Report to include, but not limited to soundness, air content, fineness, time of set, cube strength, and chemical analysis.

Make all certified source Mill Test Reports available for study by Mn/DOT personnel for at least 3 years after testing of the cement represented is completed. The Agency may require copies of these reports at any time.
D. ASTM C 917 Sampling and Documentation
The Supplier shall use an ongoing compressive strength sampling program for uniformity and take and test samples at the rate and by the procedures outlined in ASTM C 917.

The Supplier shall electronically furnish the Agency with a tabular report as outlined in ASTM C 917. Submit the report quarterly via email to MaterialsLab@dot.state.mn.us to the attention of the Mn/DOT Concrete Engineer.

E. Companion Sampling and Testing Program
The certified source and Mn/DOT shall agree on a rate and procedure for sampling and shipping a companion sample to the Mn/DOT Office of Materials Laboratory for comparison testing. The comparison sample is obtained at a minimum rate of once per month for every month of production or one sample per shipment, whichever is less.

At the manufacturing plant, port of entry, or distribution terminal, the sample for comparison testing is taken by host State personnel (if available) or plant personnel at the time of manufacture or time of discharge. Take samples in accordance with AASHTO T 127 or ASTM C 183 and split into two samples. Test one portion by an approved laboratory as outlined in section B and ship the other portion (comparison sample), at least 10 kg (20 lb.) in size, to:

Mn/DOT Office of Materials
Attn: Cementitious Comparison Sample
1400 Gervais Avenue
Maplewood, MN 55109

Ship the comparison sample to Mn/DOT within 10 days of the sample date and label as to:
- Date sampled
- Comparison sample number and mill sample number
- Lot number of the sample
- Name of Certified Source (Manufacturing Plant or Distribution Terminal)
- Available Mill Test result found at the quality control laboratory, including 3-day, ASTM C 109 test result.

Mn/DOT will report the result of the companion sampling to the Supplier of the Certified Source. If nonconformance is found, Mn/DOT will attempt to resolve the discrepancy as quickly as possible. Continued approval of the Laboratory will depend on the comparison of its test results with those of Mn/DOT’s Laboratory. If major differences are found, a third party may arbitrate the difference.

F. Project Verification/Spot Check Sampling
Mn/DOT will take verification/spot check samples periodically at the ready-mix or batch plant and at precast production plants just before incorporation into the work. Test results, which do not comply with the Specifications, are subject to Mn/DOT
Specification 1503 and continued out of tolerance results are considered sufficient cause to rescind cement or slag approval and for removal from the list of certified sources.

G. Basis of Removal from the List of Certified Sources
The Mn/DOT Concrete Engineer may remove a Manufacturer from the list of certified cementitious material sources based on the following:

1. If the Manufacturer does not supply Minnesota’s state or county projects during a three consecutive year period.
2. If the project verification samples or companion samples fail and a review of the certified source’s records indicate that there is cause for concern as to the quality of the cementitious material.
3. Failure to comply with the certification program approved by Mn/DOT.

H. Re-Certification of Certified Sources
The Mn/DOT Concrete Engineer will re-certificate the cementitious material source upon satisfactory compliance with the area of concern as outlined in section G. This may require a re-submittal of all or a portion of sections C and D.

I. Documentation, Record Keeping and Tracking
Incorporation into Mn/DOT projects prior to Mn/DOT receiving certified Mill Test Data and any cementitious material that fails the above mentioned testing, is subject to Mn/DOT Specification 1503.

The certified source shall furnish with each shipment from the manufacturing plant (or the point of certification) to the distribution terminal and finally to the ready-mix plant, batch plant or pre-cast production plant, an invoice or bill-of-lading, and all available mill test data for the cement shipped. Each copy shall indicate the manufacturer of the cementitious material, manufacturing plant location; type of cementitious material, quantity, and approximate date the product arrived from manufacturing to the distribution terminal, and the state project number, if available.

It shall also bear the following certification statement with a signature of a responsible company representative (i.e. Manager of the Supplying Company or Quality Control Supervisor).

Cement Certification Statement

Insert Company Name certifies that the cement produced at insert plant and location conforms to ASTM and Mn/DOT Specifications for Type insert Type portland cement.

GGBFS Certification Statement

Insert Company Name certifies that the slag produced at insert plant and location conforms to ASTM and Mn/DOT Specifications for Grade insert Grade GGBFS.

July 7, 2004
For truck shipments, a copy of the bill-of-lading or invoice shall accompany each load, and the Project Engineer shall retain them at the project or ready-mix plant. For rail shipments, the Supplier shall mail these copies to the Project Engineer or the ready-mix plant.

When more than one project is supplied by a ready-mix plant, the plant shall furnish the Project Engineer, for each project, either a copy of each bill-of-lading or invoice, or a listing of the bills-of-lading or invoices representing the cementitious material incorporated into the project. This listing shall bear the signature of the plant representative.

Copies of all invoices, bill-of-lading and Mill Test Reports shall remain on file at the manufacturing plant, distribution terminal or ready-mix plant, batch plant or pre-cast production plant for a period of 3 years. Mn/DOT may require copies of these reports at any time. Storage of the certified mill test and ASTM C 917 data on a CD is encouraged.

J. Certification by Other States for Cement and Cement Blends

Mn/DOT will accept cement and cement blends certified in other States providing the process complies with the following agreement:

1. The host Agency requires that the portland cement plant within its boundaries have a laboratory compliant with ASTM C 1222 Standard Practice for Evaluation of Laboratories Testing Hydraulic Cement. This lab will perform testing on the applicable types of cement (ASTM C 150/AASHTO M 85*, ASTM C 595/AASHTO M 240, C 1157) produced and shipped for State Agencies consumption. AASHTO accreditation for hydraulic cement testing of the applicable cement types is acceptable. Agency laboratories used for verification testing must meet the same criteria. *NOTE: As modified by Spec. 3101.
2. The host State Agency requires that the portland cement plant within its boundaries have a printed, Agency acceptable quality control/quality assurance plan for the production of cements used by State Agencies. The plan must include commitments to comply with ASTM C 1222 and ASTM C 183 Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement. The host State Agency verifies compliance with the quality control plan.
3. The host State Agency requires that the cement producer maintain and provide, for all lots of cement shipped, a compilation of mill reports in an electronic form. The host Agency will provide applicable data at least semiannually.
4. The host State Agency requires that the cement producer submit two samples of a regular portland cement (ASTM C 150/AASHTO M 85) and a blended portland cement (ASTM C 595/AASHTO M 240) or a performance specification cement (ASTM C 1157) if produced, semiannually for verification testing. The second sample is retained for independent analysis as needed.
5. The host State Agency requires that the cement producer submit reports for ASTM C 917 Standard Test Method for Evaluation of Cement Strength Uniformity from a Single Source for both regular portland cement and blended portland cement, if produced, at least semiannually. In lieu of ASTM C 917 sampling and testing, a report of production data analysis for the non-predominant cement manufactured at a cement plant is satisfactory.

6. The host State Agency requires that the cement producer maintains production and quality control/quality assurance records for at least seven years and make those records available if requested.

7. The host State Agency reviews submittals from the cement producer along with Agency test results. If deficiencies are discovered, the State Agency monitors corrective actions taken by the producer until the deficiencies are corrected. The reciprocal agreement State Agency is notified of the deficiencies and of each occurrence.

8. Any test results or submittals collected by the host State Agency are made available to the reciprocal agreement State Agency upon request.

9. All portland cement plant information and data is confidential within the limits of a public Agency and is for State Agencies information and inspection only.

10. Quality assurance test results of field samples, performed by a reciprocal State, are reported to the host Agency when non-compliance occurs. The reciprocal State Agency deals directly with the cement producer. The host State Agency takes action as described in Item 7. The host Agency notifies all reciprocal agreement State agencies when non-compliance occurs.

11. Portland cement tests or requirements beyond the standards stated above are provided to reciprocal State agencies by agreement between the host State and reciprocal State agencies.