

## Field Check Test of Air Meters Using a Calibration Canister

The calibration canister check test should never be used to calibrate an air meter. Air meter calibration must be performed by the water method prescribed in AASHTO T 152 (WisDOT Modified) at three points within the anticipated range of testing.

Since the calibration canister only gives one point of reference in checking the accuracy of an air meter it is suggested that a check on the accuracy of the Initial Pressure Line also be performed in conjunction with the check performed using the calibration canister. This should be performed per AASHTO T152 requirements to ensure that introducing the pressure to the air meter bowl from the air chamber pumped up to the initial pressure would result in a zero reading on the air pressure gauge. For checking the accuracy at the high end of possible air test results, two calibration canisters may be used, and the results should be consistent with the total air percentage represented by the calibration canister used. The procedure for testing the accuracy of the air meter using a calibration canister is as follows:

1. Locate the air meter bowl on a firm horizontal (level) surface.
2. Fill the bowl with clean water. It is recommended that the water sit for several minutes prior to use. This will permit air entrained in the water to dissipate.
3. Place the calibration canister upright at the bottom of the water filled air meter bowl.
4. Add water to the bowl to the point of just overflowing.
5. Place the cover (lid assembly) on the bowl and latch it down. Make certain the main air valve is closed.
6. Add water through the funnel or petcock until the meter is completely full. Gently jar the meter and tap on the sides of the bowl until no air bubbles come out the petcock.
7. Pump up pressure until the gauge needle comes to the vicinity of the red line.
8. Stabilize the gauge hand at the initial pressure line (yellow/red hand on Soil Test or White type meters, gauge line on Forney type). This is done by using the air bleeder valve.
9. Close both petcocks on the lid. Open the main air valve, tap the gauge and permit the gauge hand a few seconds to stabilize. The gauge reading should be that established for the calibration canister (see below). A reading  $\pm 0.2\%$  is considered to be acceptable.
10. If the reading exceeds the suggested tolerances a second trial should be done. Meters that read over  $+0.2\%$  after a second trial or under  $-0.2\%$  on the first trial should be removed from service and repaired and/or recalibrated as appropriate.

The calibration canisters are suitable for use with any 1/4 cubic foot (0.007 m<sup>3</sup>) air meter. The manufacturer usually establishes the canister to be equal to 5% by volume, but experience has shown the actual value to be slightly different. It is suggested that the actual percentage of each calibration canister be determined on a meter that has been water-calibrated according to AASHTO T 152 (WisDOT Modified) at three different percentage points within the anticipated range of testing through at least three repetitive tests using a calibration canister that indicate a repeatable result. An equivalent volume can be determined based on the actual volume of the meter that the calibration canister percentage was based on. Calculate the equivalent volume of the calibration canister by multiplying the volume of the bowl by the determined calibration canister percentage divided by 100. When testing is repeated using a calibration canister the canister must be removed and any water that has remained in the canister must be removed prior to any subsequent tests.

### Example 1:

Volume of the air meter bowl = 7050 mL  
 Indicated calibration canister results = 4.8%  
 Calibration canister equivalent volume =  $7050 \times 4.8/100 = 338.4$  mL  
 When a calibration canister is used in a meter with a different volume, the percentage of the calibration canister for that meter can be determined by dividing the equivalent volume calculated for the calibration canister by the volume of the air meter bowl being checked.

### Example 2:

Volume of air meter bowl being checked = 7075 mL  
 Equivalent volume of the calibration canister = 338.4 mL  
 Percent of volume of meter tested =  $338.4\text{mL}/7075\text{mL} \times 100 = 4.78\%$   
 Volume variations between air meter bowls would need to be significant to show a 0.1% difference in the indicated results compared to the calculated results using the equivalent volume

## Field Determination of Concrete Pavement Thickness

### Scope

This test method covers measuring concrete pavement thickness using magnetic pulse induction (MIT Scan).

### Interferences

This test method produces misleading results when near metal, like equipment, vehicles, dowel, and tie bars. During normal operation, steel-toe shoes shouldn't affect results unless the operator steps too close to the gauge head.

Active loop detectors can produce misleading results. Relocate plates to a new random location if their original location falls over an active loop detector.

### Apparatus

MIT Scan is an electromagnetic pulse induction device that generates a variant magnetic field that creates an eddy current that is reflected from a metal plate on the base that measures pavement thickness.

Before measuring, charge the battery if the voltage is less than 12 volts.

### Procedure

1. Obtain the contractor's plate locations from the Material Information Tracking (MIT) System.
2. Follow the instructions located in the MIT-Scan case for proper operation of the device.
3. Locate and mark the actual position of the plate center using the gauge search mode.

Figure 1 MIT Scan Device



4. Remove debris from the gauge wheel paths using a scraper and broom.
5. Place the front wheel approximately 1.5 feet before the plate center. Press the measure button and slowly push the gauge over the plate. After the gauge head has traveled approximately 6 feet, the gauge processor will calculate the pavement thickness above the plate.
6. Repeat step #5 two additional times in the same direction. For a valid test all three measurements must be within 3mm of each other.
7. Record the three thicknesses on report 136 in the MIT System for each plate. Report 136 automatically averages the three readings at each test plate location.

### Interpretation of results

If a test is invalid, rescan the plate until you have three consecutive readings that are within 3 mm of each other. If three consecutive readings within 3 mm of each other can't be obtained, and all user errors have been eliminated, the plate should be recorded as "Could not be determined". If the first test plate is identified as "Could not be determined" the department will use the second plate within that unit for acceptance. If both plates are identified as "Could not be determined" the department may core the pavement for acceptance.

### Certification Method of Acceptance for Portland Cement

Acceptance of Portland cement by the certification method provides for acceptance of these materials for use on Wisconsin Department of Transportation (WisDOT) projects upon the manufacturer's certification that the product as furnished to the contractor or purchaser complies with the pertinent specification and/or contract requirements.

WisDOT projects include state, county, and municipal federal aid and authorized county and municipal state aid projects. In order to provide Portland cement to WisDOT projects under the certification method, a manufacturer shall comply with the following procedures and requirements.

### Sampling Frequency

Under the Certification program, minimum sampling frequency will be one sample from each mill for each brand and type of cement per region per calendar year. The region materials section will coordinate sampling.

Routine field sampling of Portland cement types and sources on the certified list is not required at the project level. Project-level sampling is required for Portland cement from non-certified sources, and all fly ash, pozzolans, and slag at the frequencies defined in [CMM 8-50](#). The contractor should obtain additional samples for all cementitious materials, whether from a certified list or not, when problems with the concrete mixture are suspected or identified. Testing these additional samples will provide valuable information in troubleshooting the problem.

### Sampling Procedures

The sample submitted for test shall be a composite of several incremental samplings to provide a total weight of four to five pounds (2 - 2.5 kg). The increments may be obtained by means of a scoop or tube device and care shall be exercised to assure that contamination due to the sampling equipment or environmental conditions is not introduced. The composite sample shall be placed in a plastic bag and submitted to the Bureau of Technical Services, Truax Center Laboratory in shipping containers provided by the department. A copy of the manufacturer's certified tests analysis (mill test report) for the production lot sampled shall be furnished by the contractor and submitted with the sample.

### Identifying Samples

Download department form [DT1307](#), Cementitious Materials Data Card. An example of the completed card is shown below in Figure 5. Information from this card is necessary for the laboratory to identify the sample and to accurately and efficiently report the test results back to the regions. Therefore, it needs to be filled out completely and accurately. Record the railroad car number or the truck transport number of the shipment sampled and any other transports represented by the sample, the total quantity represented by the sample (all loads included), the location where sample was taken (such as on the project or at (company) Ready-Mix Concrete, (Location), Wisconsin), and all other pertinent information called for. Place this card inside the shipping carton along with the sample. Also indicate the brand and type of cement on the shipping label on the outside of the carton.

	Project	1101-01-74 DANE	
	Road	I-90/94 MADISON-LIVE OAK	
	Contractor	C.H.C.S. TO S.H. 78 CAPE	
Material <input checked="" type="checkbox"/> Portland Cement <input type="checkbox"/> Fly Ash <input type="checkbox"/> Slag			
Brand	Type/Class/Grade	Represents	-Mg-
LAFARGE		400	TONS
Mill/Plant Location		Truck Number	
CALABY, ALBERTA		KX293	
Sampled By		Invoice Number	
JOE TESTER		6900298	
Remarks		Date	
NON-CERTIFIED SOURCE		4/15/04	
CEMENTITIOUS MATERIALS DATA CARD DT1307 1097		Wisconsin Dept. of Transportation Truax Center - 3502 Kinsman Blvd. Madison, WI 53704-2583	

(LAB. USE ONLY)			
<b>TEST RESULTS</b>		C - No. _____	
Autoclave Expansion		Date Rec'd. _____	
Mortar Air Content			
Time of Set			
<b>COMPRESSIVE STRENGTH</b>		<b>REMARKS:</b>	
- Day		- Day	
Load, lbs (kg)	Stress, psi (MPa)	Load, lbs (kg)	Stress, psi (MPa)
Av. =		Av. =	

Satisfactory

Figure 4 Cementitious Materials Data Card, Form DT1307

**General Requirements**

This procedure provides for the following:

1. Establishing an approved list of manufacturers.
2. Manufacturer testing.
3. Manufacturer certification.
4. Verification sampling at project sites.

The manufacturer shall provide facilities and qualified personnel to perform all specification tests and maintain a quality control program. The manufacturer shall maintain records of all its control testing done in the production of Portland cements. These test records shall be available at all times for possible examination by the Bureau of Technical Services (or designated representative) and for a minimum period of five (5) years after use on a project. Acceptance of materials by this process will also be contingent upon satisfactory compliance with procedures and conformance of materials to requirements as determined by test results for verification project site samples taken by state project personnel.

Note: Hereinafter in this document, the usual designated representative (contact person) of the Office of Construction for this program is the Physical & Chemical Tests Engineer.

**Qualifying for Certification Method of Acceptance**

Manufacturers requesting certified status for supplying material from their individual facilities shall make application to the Bureau of Technical Services, who will arrange for and authorize the use of the Certification Method of Acceptance. Applicants shall provide the following prequalification documentation and information:

1. A manufacturer mill certification for each type and source of cement to be furnished for WisDOT work. The certification shall include a statement that the cement complies with specifications for the brand, type and source indicated. The certification shall be dated and include the signature and title of a person responsible for certifying the product to legally bind the manufacturer.
2. A record of monthly average test results (as on mill certifications) for each type and source of cement furnished for WisDOT work the preceding year.
3. Complete information regarding the manufacturer's quality control program (control tests, testing frequencies, laboratory facilities, programs for maintaining test and shipment records, etc.).

When the certification approval process is completed, manufacturers will be notified. Approved manufacturers are recorded on the department's approved list located at:

<http://wisconsinidot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrcs/tools/appr-prod/default.aspx>

The listing will specify the brands, types, and sources of cement approved.

**Maintenance of Certification**

Manufacturers shall request to be recertified annually. The preferred time to do this is early in the year and before construction work starts. The request shall be received in writing within one year of the previous certification date or the certified status will be terminated. The submittal shall include mill certifications, test

results, and changes in the manufacturer's quality control program occurring within the one-year period.

### **Decertification**

Certification will be withdrawn from manufacturers and they will be removed from the approved list when one or more of the following conditions exist:

1. Inability to consistently supply material meeting specifications as measured by the department's project site verification sample test results for a specific brand type and source.
2. Inability to maintain satisfactory precision between verification and manufacturer test results according to applicable ASTM or AASHTO specifications.
3. Lack of maintenance of required records.
4. Improper documentation of shipments.
5. Failure to maintain an acceptable quality control program.

Decertification of manufacturers will be by the Director of the Office of Construction. Notification will be in writing. Decertification may be issued for all materials furnished by a manufacturer or limited to a specific type and source of cement. If the manufacturer loses certification, the designated materials will only be accepted according to specific procedures agreed to by the department and manufacturer. Procedures may require pretesting and approval of materials before use in the work and/or increased frequency of project site verification or acceptance sampling and testing.

The department's costs for pretesting and increased verification or acceptance sampling and testing shall be paid for by the manufacturer or their agent, unless other arrangements are agreed to by the department.

### **Recertification**

If a manufacturer has lost certification and seeks to be recertified, the following is required:

1. Fulfill the requirements for initial certification.
2. Submit documentation to the department's quality management section chief explaining why decertification occurred and the actions the manufacturer has taken to correct the deficient conditions identified by the department.

A maximum of three months (of normal production) will be allowed for a manufacturer to regain certified status under this procedure. If, after that time, the department determines that the manufacturer has not attained satisfactory status for certification, the designated materials from that manufacturer will not be accepted for use in WisDOT projects until the brand, type and source can be recertified. The WisDOT regions will be notified of this action. Decisions regarding the future qualification for certification of a manufacturer, affected by the above process, shall be at the department's discretion.

### **Department Contact Information**

Manufacturers shall submit certification application requests and required documents for this procedure to the department central laboratory at the following address:

Wisconsin Department of Transportation  
Truax Center  
Attn.: Physical & Chemical Tests Engineer  
3502 Kinsman Boulevard  
Madison, WI 53704

The laboratory telephone number is (608) 246-3246 and FAX number (608) 246-4669.

### **Certificates and Documentation**

Only material shipped from a certified manufacturer will be accepted as certified material. Mill certified test reports of analysis, for delivered cement, shall provide the manufacturing brand, type and source of cement, complete physical and chemical test results, and a production lot number for the sample test results shown thereon. Transport loading documents shall also include brand, type, source, and lot of cement. These references will allow verification of test results by the state. The loading document shall be submitted to the purchaser (contractor) at the time of delivery of cement to a project.

In addition, ready-mix and on-site plants used by the contractor to produce portland cement concrete for department work must have the following documents available for review by the engineer at all times during production:

- The mill-certified test reports of analysis, as stated above.
- Load documents for each shipment with the manufacturer's certification, as stated above.

### Project Site Verification Samples

The department's project personnel will obtain samples by random selection from shipments of material at the project sites. The sampling rate will be a minimum of one per cement mill, for each brand and type of cement per year in each WisDOT region. Sampling will be accomplished by taking a single sample of material according to the department standard practices for sampling cement. The Materials Section in each region will coordinate sampling. The samples will be sent to the department's central laboratory for testing. Testing will be according to AASHTO standard methods. The tests to be conducted on individual verification samples will be determined by the department central laboratory personnel as being necessary to satisfactorily monitor test properties of the cement.

A copy of the manufacturer's certified test analysis (mill test report) for the production lot sampled shall be furnished by the contractor and submitted with the sample. In addition, ready-mix and on-site plants shall have the following documents available for department review at all times during Portland cement concrete production for WisDOT work:

1. A mill-certified test report of analysis.
2. Load documents for each shipment stamped with the manufacturer's certification for the brand, type, and source of cement.

The sampling will need to be coordinated by the respective regions either where the plants are located or where projects are located.

### Acceptance of Portland Cement Not on the Approved List

It is the intention of WisDOT to encourage manufacturers to become certified according to this procedure. However, if situations occur where a manufacturer's designated product is not on the WisDOT approved list, materials may be accepted for an interim period not to exceed one year according to specific procedures agreed to by the department and manufacturer. Procedures may require pre-testing and approval of materials before use in the work and/or increased frequency of project site verification or acceptance sampling and testing.

The department's costs for pre-testing and increased verification or acceptance sampling and testing shall be paid for by the manufacturer or their agent, unless other arrangements are agreed to by the department. After one year, the designated product will not be accepted for use in WisDOT projects until the brand, type, and source can be certified.

### Verification Samples with Nonconforming Results

Should a verification sample tested by the department show noncompliance with specification requirements, actions will be taken to investigate the sample failure. The purpose of the investigation(s) will be to quickly obtain information to either substantiate the failure data or to provide conclusive evidence that the reported failure is unreliable. Prompt response may help to avoid or reduce additional sample failures. The details of the process to resolve sample failures will include part or all of the following:

1. The department central laboratory will notify the Region Materials Section and request them to investigate all region activities related to procuring, handling, and submitting the sample. Together they will establish the quantity and location of material involved, as well as possible. The region will notify the contractor.
2. The department central laboratory will conduct additional tests (retests) of the sample and review other pertinent data.
3. The department will work out a program to increase verification sampling frequency for the failed product, if deemed appropriate.
4. The department central laboratory will compile all information and data for the failing sample (including information from the region).
5. The department central laboratory will issue the standard test report for the failing sample and all additional tests (retests) to the region. Copies will also be sent to the manufacturer.
6. The department central laboratory will report the investigation information to the region materials section. The report will include recommendations for the region to resolve the sample problem.
7. The region construction section will make the final decision for resolving the sample problem using input by both the region materials section and central laboratory. This decision will be communicated to the contractor and, if warranted, to the manufacturer for information and possible production adjustments.
8. The department will review the results of the investigation and take action to eliminate reoccurrence of sample failures and/or use of unsatisfactory cement. These actions may include:
  - Increase verification sampling and testing of the specific cement brand, type, and source statewide.
  - Use the findings to determine the acceptability of the specific cement in WisDOT projects when the manufacturer submits their annual request for recertification.

- Notify the manufacturer and regions that the brand, type and source of cement in question is being removed from the approved list of certified cements (i.e. decertified).