



## MEMORANDUM

<b>GENERAL SUBJECT: Manual of Instructions Revision to Chapter II Section 204.30 Reflective Materials in Pavement Markings</b>	<b>NUMBER: MD 388-15</b>
<b>SPECIFIC SUBJECT: Glass Beads Sampling, Testing and Certification Requirements for Lead and Arsenic.</b>	<b>DATE: April 15, 2015</b>
<b>DIRECTED TO:  CENTRAL OFFICE MATERIALS DISTRICT MATERIALS ENGINEERS</b>	<b>SIGNATURE:  Charles A. Babish, PE</b> <i>Signature on original copy of memorandum</i>

*The purpose of this memorandum is to compliment the changes being made in **Section 234 GLASS BEADS FOR REFLECTORIZING TRAFFIC MARKINGS of the Road & Bridge Specification Book**. The changes are necessary due to recently enacted federal transportation legislation titled, “Moving Ahead for Progress in the 21<sup>st</sup> Century” – commonly referred to as MAP-21. Section 1504 of this Act requires glass beads used in pavement markings on Federal-aid projects to contain no more than 200 parts per million of Lead or Arsenic when tested in accordance with EPA testing methods 3052 and 6010B, or 3052 and 6010C.*

*VDOT will require the manufacturers of glass beads or the manufacturers of products containing glass beads (premixed into thermoplastic or preformed tape) to submit samples or allow samples to be taken by VDOT and submitted for MAP-21 testing on a periodic basis, as directed by VDOT. The glass bead manufacturers and the manufacturers of products containing glass beads will be required to provide a written certification with each batch of material indicating conformance to this specification.*

**Revise Materials Division Manual of Instructions, Section 204.30 Reflective Materials (a) Pavement Markings (1) Sampling, Testing, Approval (a) Glass Beads by replacing it with the following:**

**(a) Glass Beads**

Glass beads are either dropped on or premixed into pavement markings. Drop-on glass beads are accepted under the Glass Bead Batch Sampling/Testing Plan or the Virginia Glass Bead Acceptance Plan (VGBAP). Glass Beads that are pre-mixed in pavement markings are accepted under Glass Beads Pre-mixed in Pavement Marking Material.

1. **Glass Bead Batch Sampling/Testing Plan** - Each batch of glass beads are sampled at the point of manufacture by either a VDOT representative or by the manufacturer and forwarded to the VDOT Central Office, Materials Division, Chemistry Lab for testing and acceptance. Batch sampling methods shall follow VDOT Batch Sampling Guidelines (Section 5) and shall include a composite sample that is representative of the entire batch. The composite sample shall be split with the manufacturer retaining half and the other half being sent to VDOT.

The Manufacturer shall test their split sample and forward their results to VDOT Central Office, Materials Division, Chemistry Lab. VDOT will test their split sample per VDOT Testing Requirements (Section 5), assign a sample number (MS #) to the glass bead sample, and notify the manufacturer of the test results prior to shipment.

In addition to the batch sampling/testing plan, the manufacturer shall comply with AASHTO M247 requirements for lead and arsenic testing and limits as described in MAP-21 Requirements (Section 4).

Each batch shipped to VDOT will be accompanied by a Certified Test Report that contains the following information:

- (a) Manufacturer's name and address
- (b) Batch, pallet, and bag numbers sampled and tested.
- (c) Quantity represented
- (d) Manufacturer's test results
- (e) VDOT, MS #
- (f) Certification statement shall read as follows:

"(Manufacturer Name) certifies that the glass beads produced for VDOT in batch (batch number) have been sampled, tested, and approved by VDOT, Central Office, Materials Division, Chemistry Lab as indicated by laboratory test number, MS #\_\_\_\_\_. We also certify that this batch conforms to AASHTO M247 including the total concentration limits for Lead and Arsenic."

Each Certified Test Report shall be forwarded to the following:

1. VDOT, Central Office, Materials Division, Chemistry Lab
2. Striping Contractor

#### Non-Compliance to Specification

Any discrepancies in sampling, test results, and certifications will be reported to the glass bead manufacturer for resolution. VDOT reserves the right to test glass beads from the field in order to verify quality. If test results from the field or the batch sampling plan are found to be out of compliance with VDOT specifications, VDOT reserves the right to discontinue acceptance of glass beads from any manufacturer.

2. **Virginia Glass Bead Acceptance Plan (VGBAP)** – This plan involves initial testing and verification of glass bead quality. Once approved, the glass bead manufacturer will be placed on the Approved List #76 and will not be required to submit a sample to VDOT from each batch. However, the manufacturer shall continue to test each batch for quality and certification purposes. The manufacturer shall submit a monthly monitor sample and a certified test report for that monitor sample. In addition, a certified test report shall be sent to VDOT Central Office, Materials Division, Chemistry Lab for each batch produced for VDOT.

In addition, the manufacturer shall comply with AASHTO M247 requirements for lead and arsenic testing and limits as described in MAP-21 Requirements (Section 4).

VGBAP Qualification Testing – For initial testing and approval, the manufacturer shall submit 5 separate, non-consecutive batch samples to VDOT for testing. Each batch sample shall be a composite sample selected from the batch per VDOT Batch Sampling Guidelines (Section 5).

From the two, 1 - quart split samples obtained, one quart shall be tested by the manufacturer and the other quart shall be sent to VDOT for testing. VDOT will test their split samples per VDOT Testing Requirements (Section 5).

VDOT will test the 5 batch samples and review the manufacturer's test results. When test results are approved, VDOT will place the glass bead manufacturer on the VGBAP Approved List # 76.

Following approval under the VGBAP, the manufacturer shall certify each batch produced for VDOT by providing a Certified Test Report that contains the following information:

- (a) Manufacturer's name and address
- (b) Batch, pallet, and bag numbers sampled and tested.
- (c) Quantity represented
- (d) Manufacturer's test results
- (e) Certification statement shall read as follows:

"(Manufacturer Name) certifies that the glass beads produced for VDOT in batch (batch number) meet VDOT Road and Bridge Specifications, Section 234. We also certify that this batch conforms to AASHTO M247 including the total concentration limits for Lead and Arsenic."

Each Certified Test Report shall be forwarded to the following:

- 1. VDOT, Central Office, Materials Division, Chemistry Lab
- 2. Striping Contractor

The manufacturer shall maintain a file of certified test reports for all glass bead batches shipped to VDOT facilities or batches shipped to contractors that perform

work for VDOT. These reports shall be retained by the manufacturer for a minimum of 12 months and are to be readily available for verification by VDOT personnel.

Monitor Sample- When the glass bead manufacturer is approved and added to the Approved List # 76, each batch produced will not need to be sampled and tested by VDOT. Instead, a monthly monitor sample shall be taken by the manufacturer from a random batch produced for VDOT per VDOT Batch Sampling Guidelines (Section 5). One of the split samples shall be tested by the manufacturer and the other split sample shall be sent to VDOT for testing along with a copy of the manufacturer's certified test report. VDOT will test their split of the monitor sample, compare results against the manufacturer's results, and review the certified test report.

#### Non-Compliance to Specification

Any discrepancies in sampling, test results, and certifications will be reported to the glass bead manufacturer for resolution. VDOT reserves the right to test glass beads from the field in order to verify quality. If test results from the field or the monitor program are found to be out of compliance with VDOT specifications, VDOT reserves the right to remove the manufacturer from the approved list or discontinue acceptance of glass beads entirely.

### **3. Glass Beads Pre-mixed in Pavement Marking Material**

If a pavement marking material contains incorporated glass beads (Example- Thermoplastic, Preformed Tape, Reflective optics containing glass beads) the manufacturer of that pavement marking material shall comply with AASHTO M247 requirements for lead and arsenic testing and limits as described in MAP-21 Requirements, (Section 4).

Batch Certification Requirements – The pavement marking material manufacturer shall provide written certification for each batch that their glass bead materials meet the MAP-21 testing requirements and limits for Lead and Arsenic. The certification statement shall read as follows:

"(Manufacturer Name) certifies that the glass beads used in (Manufacturer's name and Product) (batch number) conform to AASHTO M247 total concentration limits for Lead and Arsenic."

This certification Statement can be combined with other batch certification documentation and shall be forwarded to the following:

1. VDOT, Central Office, Materials Division, Chemistry Lab
2. Striping Contractor

### **4. MAP-21 Requirements:**

The MAP-21 program for glass beads (Section 1504) requires glass beads used in pavement markings to contain no more than 200 ppm Lead or Arsenic, as determined in accordance with EPA testing methods 3052 and 6010B, or 3052 and 6010C.

- (a) Periodic Testing Requirements- VDOT requires glass bead manufacturers or manufacturers of pavement marking products containing glass beads to submit a sample (from a batch being shipped to VDOT) to a VDOT approved, independent, third party lab for lead and arsenic testing as described above. The manufacturer shall provide a 1-quart split of this sample to VDOT for their testing.

The manufacturer shall also allow VDOT or its representative to obtain samples of glass beads per VDOT Batch Sampling Guidelines, (Section 5). If VDOT obtains the sample, they will forward the sample to an approved lab for lead and arsenic testing as described above, (See Note 1). The split sample may be forwarded to the manufacturer, if requested.

The sampling party (VDOT or Manufacturer), testing frequency and batch sample identification shall be as directed by VDOT.

Results of lead and arsenic testing shall be submitted to VDOT, Central Office Materials Division Chemistry Lab for review within 30 calendar days of sampling.

- (b) Batch Certification Requirements - Additionally, all glass bead manufacturers or manufacturers of pavement marking products containing glass beads shall submit (with each VDOT batch), a written certification that their glass bead materials meets the MAP-21 testing requirements and limits for Lead and Arsenic. The required certification statements are included in the plans listed above (Section 1, 2, or 3).

Raw Material Change Requirements - If the raw material source for their glass beads should change, the glass bead manufacturer or the manufacturers of pavement marking products containing glass beads shall advise VDOT within 30 calendar days and allow for sampling and testing as described in Section (a) above.

**Note 1:**

The glass bead manufacturers or manufacturers of pavement marking products containing glass beads shall arrange for payment to the VDOT approved, independent, third party lab for the MAP-21 testing and reporting to VDOT, Central Office Materials Division.

**5. VDOT Batch Sampling Guidelines and Testing Requirements**

VDOT Batch Sampling Guidelines:

A batch is normally defined as approximately 44,000 pounds of glass beads or 880, 50 pound bags. Standard sampling protocol requires the cube root of the total number of bags to be sampled. The cube root of 880 is approximately 10. Therefore, 10 random bags from a 44,000 lb. batch need to be selected. The 10 bags will be opened, split down using a splitter and combined until two, 1 quart samples are obtained. The two samples shall be labeled with the manufacturer's name, date of sampling, and batch number. While some

manufacturers pull sample aliquots of different quantities, it is recommended that the ratio described above be followed.

VDOT Testing Requirements:

VDOT glass beads shall conform to the requirements of AASHTO M 247 which requires testing per AASHTO T 346. This includes - Glass Bead Roundness, ASTM D1155, Procedure B; Glass Bead Sieve (Gradation) Analysis, ASTM D1214; Glass Bead Moisture Resistance, AASHTO T346. If glass bead manufacturers use test methods different from VDOT and testing results are disputed, manufacturers shall meet VDOT specification while being tested per VDOT test methods listed above. VDOT or its representative reserves the right to inspect the manufacturer's test equipment, procedures, and quality control program.

cc:	Deputy Chief Engineer	Virginia Center for Transportation Innovation and Research
	Division Administrators	Virginia Ready-Mixed Concrete Association
	District Administrators	Precast Concrete Association of Virginia
	District Location & Design Engineers	Virginia Transportation Construction Alliance
	District Construction Engineers	Federal Highway Administration
	District Maintenance Engineers	American Concrete Paving Association
	District Bridge Engineers	NE Chapter, Southern Region
	District Traffic Engineers	Old Dominion Highway Contractors Association
	Virginia Asphalt Association	