Minnesota Department of Transportation
Specification 3754
Poly-Alpha Methylstyrene Membrane Curing Compound
Manufacturer Approval Program
May 30, 2024

The Minnesota Department of Transportation will accept curing compounds only from approved sources. This applies to all curing compounds sold to contractors for use on MnDOT projects meeting MnDOT Specification 3754, "Poly-Alpha Methylstyrene Membrane Curing Compound and shall conform to ASTM C309, Type 2 White Pigmented, Class B. All membrane curing compound materials shall be formulated to maintain the specified properties for a minimum of one year from date of manufacture.

To be accepted as a MnDOT Approved Source, a Manufacturer must demonstrate an ability to manufacture a curing compound meeting the requirements of MnDOT Specification 3754.

- Provide a MnDOT approved Quality Control Program.
- Provide samples for verification for each batch or lot supplied to MnDOT projects
- Provide Manufacturer's QC test results
- Supply shipping information
- Certify that their product meets the requirements of MnDOT Specifications 3754
- Certify that the resin is 100% Poly-Alpha Methylstyrene
- Submit written agreement to this program

Acceptance of curing compounds under this program is based on the Manufacturer's certification and quality control testing as verified by MnDOT Materials Lab testing of "verification" samples and spot checks on samples obtained from Contractor's stock or from project sites. MnDOT testing is for verification of the Manufacturer's QC testing. Discrepancies in test results between Manufacturer's lab and the MnDOT Materials Lab that indicate significant deviation from MnDOT specifications, which cannot be resolved, may result in removal of a Manufacturer from the Approved Source List.

AASHTO's Product Evaluation & Audit Solutions (formerly NTPEP) Testing

MnDOT requires the following to have their product tested though AASHTO's Product Evaluation & Audit Solutions Program (formerly NTPEP) https://transportation.org/product-evaluation-and-audit-solutions/ and obtain passing results in accordance with MnDOT Specifications:

- Manufacturers not previously on the approved list
- Manufacturers that have been removed or suspended from the approved list
- Manufacturers supplying a new product
- Manufacturers reformulating existing approved products

Once this test data is provided demonstrating a Manufacturer's ability to produce material meeting MnDOT specification requirements the Manufacturer can submit to MnDOT for approval and testing.

After initial testing, MnDOT requires continued product evaluation though AASHTO's program every 3 years.

Manufacturer Quality Control Program

A written Quality Control Program that monitors a Manufacturer's production shall be submitted for MnDOT approval.

The written program shall detail the following information:

- Frequency of sampling and testing
- Types of tests performed on each batch or lot
- Explanation of batch or lot designation (significance of each letter and number)
- Raw materials

The Manufacturer shall submit in writing their acceptance to participate in MnDOT's Approved Curing Compound Manufacturer Program. Acceptance will remain in effect until denied by MnDOT or until subsequent re-approval is requested. A yearly application in writing need not be made.

Testing

Tests will be performed according to ASTM Standards, Federal Test Methods, or MnDOT Methods as detailed in the MnDOT product specification. Other test methods may be used upon approval by MnDOT. Testing frequency shall be according to Manufacturers approved QC Plan. QC test results on finished batches shall be submitted to the MnDOT Materials Lab along with the Verification Samples.

Verification Samples

Samples shall be taken for testing by an Agency Representative or other agreed upon procedure. Samples shall be tested and approved by MnDOT prior to shipping of materials. MnDOT will email the Manufacturer the verification sample test results which include an "Approved" or "Does not meet requirements" status.

Shelf Life

All curing compounds submitted for approval shall have a maximum shelf life of 1 year. The Engineer may require additional testing before use to determine compliance with these specifications if the curing compound has not been used within one year or whenever the Engineer has reason to believe the curing compound is no longer satisfactory.

Certification

Each shipment to the project shall be accompanied by Manufacturer's written certification listing batch number quantity, original manufacture date, certifying the resin is 100 percent Poly-Alpha Methylstyrene and certifying that the product meets MnDOT Specifications 3754. A copy of the certification shall be submitted to the MnDOT Materials Lab.

Submittal Requirements

Manufacturer shall submit the following with each sample for approval:

- A 1 quart sample of each batch or lot manufactured
- A Certificate of Compliance with the following information:
    - Batch/lot ID and size
    - Manufacturer's QC test results for the batch/lot
    - Manufactured date of curing compound
    - Certification stating that the sample is representative of the batch manufactured and the batch/lot meets MnDOT Specification 3754
    - Certification stating that the resin is 100 percent Poly-Alpha Methylstyrene
- A Materials Safety Data Sheet (MSDS)
- A Technical Data Information Sheet

Submit to:
Minnesota Department of Transportation
Attention: Cement and Soils Lab
Office of Materials & Road Research
1400 Gervais Avenue
Maplewood MN 55109

Approval Procedure

The approved batch or lot will be added to the MnDOT Approved Products Curing Compound website. http://www.dot.state.mn.us/products/concrete/curingcompounds.html Included on this site will be approved curing compound, Manufacturer name, batch or lot ID, and the expiration date. The expiration date will be 1 year from original date of manufacture depending on the type of curing compound unless the Manufacturer and MnDOT identify a more appropriate date to use for approval. The approved curing compound will be removed from the list after the expiration date has been reached and will no longer be allowed on MnDOT projects unless otherwise approved for use by the Engineer.

Non-compliance

Non-compliance with the requirements of the curing compound Manufacturer approval program may result in removing a Manufacturer from the approved list.

MnDOT reserves the right to collect field samples of these products for comparison to the reference samples you sent us, as stipulated in section 6 of AASHTO M-194-87, "Uniformity and Equivalence". If samples of these materials do not meet MnDOT specifications or the uniformity requirements, the product may be removed from the approved product list and subject to other failing material procedures.

Minnesota Department of Transportation
Test Methods for White Pigmented Poly-Alpha Methylstyrene Membrane Curing Compound (ASTM Designation C309 Type 2 Class B)
February 2021

1. Scope

These test methods cover the testing requirements of white pigmented poly-alpha methylstyrene based concrete curing compounds.

2. Referenced Documents:

ASTM Standards:

C156	Standard Test Method for Water Retention by Concrete Curing Materials
C1315	Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
D1644	Test Method for Nonvolatile Content of Varnishes
D2371	Test Method for Pigment Content of Solvent Reducible Paints
D3723	Test Method for Pigment Content of Water Emulsion Paints by Low Temperature Ashing
D2621	Standard Test Method for Infrared Identification of Vehicle Solids from Solvent Reducible Paints
E1347	Standard Test Method for Color and Color Difference Measurement by Tristimulus (Filter) Colorimetry

3. Solvents:

Extraction Mixture- Mix 10 volumes of ethyl ether, 6 volumes of toluene, 4 volumes of methyl alcohol and 1 volume of acetone. See hazard precautions in Section 6 of ASTM D2371.

4. Procedure

4.1 Vehicle Solids and Pigment Content

Total solids and % pigment shall be determined according to Section 8.6 of C1315. Percent pigment can be determined either by D3723 or by D2371. Use extraction mixture listed above when using D2371. Retain extracts from D2371 for Infrared identification of curing compound vehicle.

% Vehicle Solids = %Total Solids - % Pigment

The curing compound shall have a minimum of 42% total solids by weight and the vehicle shall be 100% poly-alpha methylstyrene.

4.2 Infrared Identification of Vehicle Solids

Use ASTM D2621 to prepare vehicle solids for infrared identification with the exception that D2371 shall be used to separate vehicle from pigment. If D 3723 was used to determine % pigment, then a separate sample shall be used to prepare vehicle solids for infrared identification. Infrared spectrum of the vehicle solids shall match the reference spectrum of poly-alpha methylstyrene prepared at MnDOT Chemical Laboratory.

4.3 Water Retention

Use ASTM C156 to test for water retention efficiency with the exception that measurements shall be taken at 24 hours and 72 hours.

The loss of water shall not be more than 0.15 kg/ m^2 at 24 hours and no more than 0.40 kg/ m^2 at 72 hours.

4.4 Reflectance

Use ASTM E1347 when measuring reflectance.

45/0 geometry color spectrophotometer or colorimeter using CIE Illuminant D65 with 2^o Standard Observer shall be used to measure reflectance. Reflectance is Y in the CIE Y,x,y color measurement system.

The 3 day reflectance readings shall be greater than 65.

4.5 Three Day Settlement Test

Pour curing compound into a 100ml-graduated cylinder until bottom of meniscus reaches the 100ml mark. The graduated cylinder shall have sub-divisions of 1 ml.

Using disposable pipet remove any air bubbles incorporated into curing compound upon pouring into graduated cylinder. At this time you may add or extract excess curing compound to reach 100ml mark.

Secure a rubber stopper in the graduated cylinder to minimize evaporation and leave sample undisturbed for 3 days. At the end of the 3-day time period measure the amount of settling to the nearest ml. The degree of settling is the amount of clear, colorless supernatant liquid in the graduated cylinder.

The settling of the curing compound shall not exceed 2 ml after 3 days.