

MnDOT Bridge Deck Crack Sealer Qualification Procedure

1. Material Qualification Process

- a. Send a personalized submittal package to:

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- b. Submittal package should include:

- Completed New Products Application Form (attached)
- Product Data Sheets including mixing and curing directions
- Safety Data Sheets
- Performance History References in a cold, heavy salt spray environment
- Quart of each component for Infrared Spectrum and Verification Testing
- Certification that products meet Minnesota Statute 115A.9651 requirements for heavy metals and VOC requirements
- Independent lab testing verifying requirements in Table 1, Table 2, or Table 3.
- Completed MnDOT Office of Environmental Services Hazardous Evaluation Process Documentation (attached)

- c. Material Qualification Requirements

Category 1 Epoxy Crack Sealers

Epoxy crack sealers can be further divided into two sub-categories: High Elongation Epoxy Crack Sealers and High Strength Epoxy Crack Sealers. Provide an epoxy crack sealant material that meets the following physical and performance requirements shown in Tables 1 or 2.

Table 1: Qualification Requirements for High Elongation Epoxy Crack Sealers	
Viscosity, ASTM D 2196	250 cps (or less)
Gel Time, ASTM C 881	Report
14 Day Bond Strength, ASTM C 882	300 psi minimum
Compressive Yield Strength, ASTM D 695	500 psi 7 day minimum
Tensile Strength, ASTM D 638	150 psi minimum
Tensile Elongation, ASTM D 638	25% minimum

Table 2: Qualification Requirements for High Strength Epoxy Crack Sealers	
Viscosity, ASTM D 2196	125 cps (or less)
Gel Time, ASTM C 881	Report
14 Day Bond Strength, ASTM D 695	1500 psi minimum
Compressive Yield Strength , ASTM D 638	4000 psi 7 day minimum
Tensile Strength, ASTM D 638	6,000 psi minimum
Tensile Elongation, ASTM D 638	2.5 – 5.0%

Category 2 Methacrylate Crack Sealers

Provide a methacrylate crack sealant material that meets the following physical and performance requirements:

Table 3: Qualification Requirements for Methacrylate Resin Crack Sealers	
Viscosity, ASTM D 2196	25 cps (or less)
Gel Time, ASTM D 2471	60 minutes maximum
Tack Free Time, ASTM D 1640	5 Hours maximum at 72F and 50% R.H.
Tensile Elongation, ASTM D 638	1.5% minimum
Shear Bond Adhesion, ASTM C 882	>1500 psi

2. MnDOT Bridge Office Field Performance Evaluation

MnDOT feels it is critical to develop procedures to evaluate the field performance of bridge deck crack sealers in order to provide guidance and data to Contractors and MnDOT bridge maintenance personnel so that high quality products will be used and long-term performance ensured. Therefore, the MnDOT Bridge Deck Crack Sealer Qualification Process will include a field performance evaluation over a two year period.

Following verification that the product’s certified independent lab results meet the appropriate material specifications shown in Tables 1, 2 or 3, MnDOT will contact the product manufacturer to initiate the field performance evaluation phase. The manufacturer and MnDOT will mutually agree upon the labor, equipment, and materials required to prepare the cracks and install the crack sealant material. The manufacturer will supply all of the labor, equipment, and materials required at the manufacturers’ expense. Traffic control, installation scheduling, and installation location will be provided by MnDOT. The manufacturer’s technical representative must be present at the installation of the sealant and provide written certification that the material is installed in accordance with their recommended procedures.

Field performance will be evaluated by the MnDOT Bridge Office based on visual observation of the percentage of adhesion and cohesion failure as defined below and petrographic analysis of cored samples.

- *Adhesion Failure:* Any visual separations or openings between the sealant and the concrete interface. Any openings too narrow to practically measure (insignificant) will not be documented as adhesion failure.
- *Cohesion Failure:* Any visual cracks, splits or openings in the sealant. Cracks, splits or openings that are too narrow to practically measure (insignificant) will not be documented as cohesion failure.

Visual observations will be performed after each respective winter season for two years and documented on a Crack Sealant Evaluation Worksheet (attached).

Cores will be taken by MnDOT following the second winter season. The Manufacturer will pay a certified independent testing laboratory to perform a Petrographic analysis consisting of:

- Photographing the as-received condition of the cores;
- Photographing the top and sides of the sealed crack;
- Documenting crack orientation and surface width (assuming the core did not split during coring);
- Cutting the cores perpendicular to the crack (at a very slow rate to minimize damage to the core and sealant);
- Polishing one face of the cut cores for microscopic examination. An inspection of the core face will be performed before and after cutting and then compared to the polished face to make sure no damage of the sealant has occurred during polishing (a stabilizing agent may be required);
- Microscopic documentation of the condition of the concrete-sealant interface and the sealant itself; and
- Microscopic documentation of the penetration depth of the sealant in the crack.

If the field performance of the product meets expectations following the first winter (see evaluation worksheet), MnDOT will grant provisional approval of the product for use on a limited number of projects. Following completion of the two-year field performance evaluation phase, MnDOT will notify the product manufacturer of the final approval status. Upon meeting the acceptance criteria, the submitted bridge deck crack sealant will be placed on MnDOT's Approved Products List.

CRACK SEALANT EVALUATION - PERFORMANCE CRITERIA

Each crack is rated for its effectiveness:

- Effective: $\%L = 0\% < \%L < 10\%$
- Moderately Effective: $10\% < \%L < 20\%$
- Somewhat Ineffective: $20\% < \%L < 30\%$
- Ineffective: $\%L > 30\%$

Evaluate ten transverse (full lane width) cracks per sealant for performance and calculate average total percent failure.

To meet performance expectations:

After one winter season, average total percent failure is within the effective range.

After two winter seasons, average total percent failure is within the moderately effective range.

State of Minnesota
Department of Transportation
New Product Preliminary Information Form

INSTRUCTIONS: Answer ALL questions. Where a question is not applicable enter "N/A".
Attach additional sheet(s) as required with reference to item number.

Date: _____

1. Trade Name _____

Manufacturer _____

Phone No. (_____) _____

Address _____ City _____ State _____ Zip _____

Patent pending Yes ____ No ____ Patent No. _____

2. Local Distributor _____ Phone No. (_____) _____

Address _____ City _____ State _____ Zip _____

3. Recommended Primary
Use: _____

4. Describe product, material equipment or process:

5. Describe any limitations or use restrictions:

6. Material composition (attach laboratory test results, storage requirement, shelf life,
Material Safety Data Sheet and disposal procedure):

7. Outstanding feature or advantage claimed:

8. Date introduced on market _____. Alternate for what existing product?

9. a. Total Estimated Cost Per Unit Material (including delivery) _____
b. Total Estimated Cost Per Unit Furnished and Installed _____

10. Does product meet requirements of any of the following specifications?
(Give specific number.)
AASHTO _____ ASTM _____ Fed. Spec. _____ Mn/DOT _____
Others (state and attach specifications) _____

11. Indicate whether this product has been evaluated by a national or regional product
evaluation program? (Attach any results.)

_____ HITEC _____ NTPEP _____ Others (specify)

12. Cite use by other agencies and persons to be contacted concerning experience with use,
including how many years used, and whether use has been experimental or routine (list
names, titles, mailing address and phones):

13. Note here and attach any test results, reports, etc., from the organizations above:

14. Is a documented quality control process available for this product?

15. Who has been contacted within Mn/DOT about this product? _____

Has this person been sent a copy of this form? _____

16. Additional comments: _____

Name and Title of person completing this form:

Address, State, Zip:

Date: _____ Phone: (_____) _____

Email Address: _____

_____ Manufacturer _____ Representative

Introduction

This document describes the procedures for implementation of the Minnesota Department of Transportation's (MnDOT's) Hazard Evaluation Process Policy.

Definitions

Approved/Qualified Products process

The process to approve or qualify products, materials, or engineered systems for use on MnDOT property and construction and maintenance projects.

Hazardous Substance

A chemical, mixture of chemicals, or material possessing a hazardous characteristic as described in [Identification and Listing of Hazardous Waste, Part 261](#), Code of Federal Regulations.

Hazardous Waste

Any refuse, sludge, or other waste material or combinations of refuse, sludge or other waste materials in solid, semisolid, liquid, or contained gaseous form which because of its quantity, concentration, or chemical, physical, or infectious characteristics may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." ([Minnesota Statutes §116.06, subd. 11](#)).

Waste Material

A material that is no longer suitable for its original intended purpose because of wear, damage, defect or a worthless or useless byproduct resulting from industrial, commercial, mining, agriculture, infrastructure, or community activities and includes contaminated soil, water, solids, semisolids, sludge, gas, and solid waste.

Procedures

1. Employees must understand product procurement and waste material re-use criteria.

- Under no circumstance will MnDOT accept hazardous wastes or hazardous substances from others for re-use or any other purpose.
- Refer to the [MnDOT Approved/Qualified Products Policy](#) that applies to materials, products, and engineered systems for use on MnDOT property and construction and maintenance projects. Use of the process and product lists assist MnDOT with the following:
 - Preparing procurement specifications when a material, product or engineered system is on an existing [Approved/Qualified Products List](#)

- Understanding the procedure for evaluating new material, product, or engineered system for possible inclusion on an [Approved/Qualified Products List](#)
- Consider potential use of research and development opportunities to provide additional information needed to evaluate use of the product or waste material.

2. The Office of Environmental Stewardship (OES) receives information for MnDOT consideration.

OES evaluates materials, products, or engineered systems for MnDOT use based on Minnesota law. Approvals from other states or governmental agencies do not replace MnDOT evaluation processes.

Information provided to OES should include the following:

- Manufacturer information
 - Name of Company
 - Address
 - Technical Contact Name and Telephone Number
- Product information
 - Product trade name and chemical name, if applicable
 - Product Technical Data Sheet
 - Safety Data Sheets (SDS) for all chemicals in the product/waste material
- Chemical status
 - Provide individual chemical & physical properties; melting point (EPA Method 830.7200); boiling point (830.7220); water solubility (830.7840); storage stability (830.6317); dissociation constant (830.7370); partition coefficient (830.7570); vapor pressure (830.7950); soil adsorption coefficient (835.1230); and hydrolysis (835.2130) or equivalent methods
 - Identify chemicals with molecular weights greater than 1000 Daltons (OECD Methods 118 or equivalent method)
 - Proof that final product will not be a hazardous waste (EPA Toxicity Characteristic Leaching Procedure 1311 under current Minnesota Rules Chapter 7045.0131) if spilled or disposed of during product life cycle
 - Provide Names and Chemical Abstract Services numbers (CAS numbers) of the reportable substances in the product (40 CFR 302)
- Product-specific testing information

The following product-specific testing information is required, if known. If information for a representative test is unknown, it must be stated as such. Testing must follow standardized testing procedures, such as U.S. EPA SW-846 test methods, OECD test methods, or U.S. EPA Office of Chemical Safety and Pollution Prevention Harmonized Test Guidelines.

 - Chemical leaching
 - EPA Synthetic Precipitation Leaching Procedure 1312 with subsequent analysis for metals and product components
 - Chemical biodegradation
 - Ready biodegradability (EPA Method 835.3110)
 - Aerobic mineralization (835.3190)
 - Inherent biodegradability (835.3215)
 - Soil biodegradation (835.3300)
 - Aerobic soil metabolism (835.4100), or equivalent methods
 - Chemical Ecotoxicity (harmful to the environment or a specific ecosystem)

- Include three trophic levels;
 - Acute daphnia (water flea) toxicity (EPA Method 850.1300)
 - Fish early life stage toxicity (850.1400)
 - Algae growth inhibition (850.5400)
 - Terrestrial plants growth (850.4100)
 - Earthworm acute toxicity (850.6200) or equivalent methods
- Other available test methods that provide individual chemical fate and pathway information.

3. The Office of Environmental Stewardship (OES) reviews the information provided.

OES reviews the information provided and makes a recommendation to the APL/QPL Review Coordinator based on the expected environmental performance.

Frequently Asked Questions

Who pays for the testing required by the Hazard Evaluation Process?

The product manufacturer is responsible for all costs associated with testing requirements.

Is this evaluation necessary if another state has approved a product or waste material?

Yes, MnDOT evaluates materials, products or engineered systems for use based on Minnesota law. An approval from other state does not replace the MnDOT Approved/Qualified Products process.

Are all product submittals to the MnDOT Approved/Qualified Products Process subject to HEP review?

No, only products or proposed reuse of waste materials that have a potential to release chemicals during application or long-term use of the product or material and that could result in contamination of the environment are evaluated with the MnDOT Hazard Evaluation Process.

Is the environmental review for a product, material or engineered system required when the respective item does not have an Approved/Qualified Products List?

Yes, a review by the Office of Environmental Stewardship is required.