

## GENERAL QUALIFIED PRODUCTS LIST

### 1. Scope

- 1.1 The Qualified Products List (QPL) is a list of manufacturers and materials for certain products that have been laboratory or field tested by MDOT or by a third party and have been found to meet specifications and performance criteria. Each QPL has its own evaluation procedure and requirements for remaining on the list. The lists are found in the Materials Source Guide.

### 2. Documentation Requirements

- 2.1 Items incorporated into MDOT projects that are selected from a QPL are required to be documented by using one of the following methods:
  - 2.1.1 Notation on an IDR by naming the manufacturer, product, and stating that the labeling of material was checked and verified.
  - 2.1.2 Placement of label or copy of label, tag, etc. in the Project File.
  - 2.1.3 Monthly Report on Material Inspection (Form 1158) in the file naming the product and manufacturer as verified in the field.
- 2.2 As always, proper cross-referencing is required in order to trace the documentation for these items.

**QUALIFICATION PROCEDURE  
FOR  
CONCRETE PAVEMENT REPAIR,  
GROUT FOR FULL-DEPTH CONCRETE PAVEMENT REPAIRS**

1. Scope

- 1.1 This document covers the physical requirements for adhesive systems for grouting dowel and tie bars for full-depth concrete pavement repairs and the procedures to be followed by producers in order to have their products included on MDOT's Qualified Products List for a qualification period of three years.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below:

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as bar and hole preparation, mixing and working times, gel and final cure times, etc., of the adhesive system submitted.
- 2.3 *Evaluation Based on the Following Standards* - Submit two cartridge and four to six static mixing nozzles and nuts. If a mixing gun other than a standard hand-operated mixing gun is required, include it in the shipment. The MDOT Materials Technology Group will evaluate for compliance with the requirements set forth in the physical requirements section of this document.
- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

3. Evaluation

- 3.1 The submitted information will be reviewed and tests will be set up. If the product meets the physical requirements of Table 1, it will be placed on the Qualified Products List. MDOT reserves the right to re-evaluate a product at any time. The submitter will be notified in writing concerning the result of the evaluation.

4. Disqualification

- 4.1 A product may be removed from the Qualified Products List should any problem develop during mixing, placing, or in performance. MDOT must be notified in writing of any change in the product formulation. Specific changes may require re-evaluation of the product.

## 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submission of a written request, along with acceptable evidence that the problems causing the disqualification have been corrected.

## 6. Testing Procedure

- 6.1 *Gel Time* - The gel time shall be tested in accordance with ASTM C 881, except the 30 minutes will be a maximum rather than a minimum and the samples shall be 100 grams.
- 6.2 *Insertability of Bars* - Cast 20 x 18 x 12 inch (500 x 450 x 300 mm) deep blocks of concrete according to ASTM C 192. Moist curing shall occur until the blocks have reached an age of 14 days, when they will then be removed from the moist environment. Then drill a maximum of twelve 1½ inch (38 mm) diameter by 8 inch (200 mm) deep holes. The holes, measured from their center, shall be at least 2½ inches (63 mm) away from any edge of the block and at least 2½ inches (63 mm) away from any other hole. Remove dirt and debris from holes with compressed air or wire brush. Store the blocks until they are needed. One block can be used until all holes have been utilized. When ready to test, gun enough material into one hole to completely fill the space around the bar after it is inserted. Then insert a 1¼ inch (35 mm) diameter bar slowly into the hole, rotating to allow any air voids to escape. This is all done with the long axis of the hole and bar positioned horizontally. The bar shall be able to be inserted in less than 30 seconds. This test shall then be repeated once.
- 6.3 *Loss of Adhesive Material* - After the insertability test, the excess adhesive is troweled flush with the concrete. The system shall then be allowed to fully cure at which time the amount of adhesive that has flowed out from the space between the top of the bar and the top of the hole is measured. This depth from the face of the concrete at the edge of the hole to the adhesive shall not be more than ¼ inch (7 mm).

7. Physical Requirements for Adhesive Systems for Grouting Dowel and Tie Bars for Full-Depth Concrete Pavement Repairs

	Result	Spec
Gel Time, minutes		30 max.
Insertability of bars, seconds		30 max.
Loss of adhesive material, inch (mm)		¼ (7) max.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Material: **PASSES** or **FAILS** (circle one)

MDOT testing by: \_\_\_\_\_ Date: \_\_\_\_\_

**QUALIFICATION PROCEDURE  
FOR  
NON-SHRINKING MORTAR AND GROUT, PREMIXED, TYPE H-1 (NON-METALLIC)**

1. Scope

- 1.1 This document covers the physical requirements for non-shrinking mortars and grouts and the procedure to be followed by producers in order to have their products included on MDOT's Qualified Products List for a qualification period of three years.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below. Portions of the physical requirements report sheet that may require test data to be furnished by the submitter must be completed in full.

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc. of the non-shrinking mortar or grout submitted.
- 2.3 *Evaluation Based on the Following Standards* - Include a report of tests conducted by an independent laboratory. The physical properties of the product must be filled out and meet the requirements given in Section 7, Physical Requirements. Descriptions of the test procedures are attached.
- 2.4 *Evaluation Scheduling* - Completed submittals will be evaluated by MDOT throughout the year.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

4. Disqualification

- 4.1 A product may be removed immediately from the Qualified Products List if any problems develop related to installation or performance.

5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the qualification period.

## 6. Testing Procedure

### 6.1 Preliminary Information and Preparation for Specimens

- 6.1.1 *Type of Non-Shrink Grout* - Specify whether non-shrinking mortar or grout, non-metallic (H-1), is Grade A (pre-hardening volume-adjusting), Grade B (post-hardening volume-adjusting), or Grade C (combination volume-adjusting). Record on the Physical Requirements Sheet attached.
- 6.1.2 *Preparation of Specimens* - The specimens and procedures will follow ASTM C 1107.

### 6.2 Required Independent Laboratory Testing

- 6.2.1 *Consistency* - The consistency of the material will be testing in accordance with ASTM C 109 and ASTM C 939 as applicable.
- 6.2.2 *Yield* - The yield for the material will be tested in accordance with ASTM C 138.
- 6.2.3 *Compressive Strength* - The compressive strength of the material will be tested in accordance with ASTM C 109 and modified as indicated in Section 11.5.1-11.5.3 of ASTM C 1107.
- 6.2.4 *Early Age Height Change* - Determine the early-age height change of grout in accordance with the applicable portions of Test Method C 827.
- 6.2.5 *Height Change of Hardened Grout* - Determine height change of hardened grout at 1, 3, 14 and 28 days in accordance with Test Method C 1090 and report.

## 7. Physical Requirements

To be completed by independent testing laboratory:

### 7.1 *Required Grout/Mortar Information:*

Grade of Non-Shrink Grout: A, B, or C (circle one)

### 7.2 *Required Independent Laboratory Testing Data:*

A) Fluid (freshly mixed grout at manufacturers minimum recommended temperature)

Temperature as tested: \_\_\_\_\_ °F (°C) Water Added

Consistency (10-30 seconds by flow cone required) as tested: \_\_\_\_\_ seconds

Yield as tested: \_\_\_\_\_ cubic foot (m<sup>3</sup>)

Compressive Strengths:

Time	Required Strength	Actual Strength
3 Days	2500 psi (17.2 MPa)	
7 Days	3500 psi (24.1 MPa)	
28 Days	5000 psi (34.5MPa)	

Early Age Height Change: \_\_\_\_\_ % (ASTM C 1107)

Height Change of Moist Cured Hardened Grout: (ASTM C 1107)

Grade Classification (A, B, or C)	Actual % Change 1 Day	Actual % Change 3 Days	Actual % Change 14 Days	Actual % Change 28 Days
	%	%	%	%

B) Fluid (freshly mixed grout at manufacturers maximum recommended temperature)

Temperature as tested: \_\_\_\_\_ °F (°C) Water Added

Consistency (10-30 seconds by flow cone required) as tested: \_\_\_\_\_ seconds

Yield as tested: \_\_\_\_\_ cubic foot (m<sup>3</sup>)

Compressive Strengths:

Time	Required Strength	Actual Strength
1 Day	1000 psi (6.9 MPa)	
3 Days	2500 psi (17.2 MPa)	
7 Days	3500 psi (24.1 MPa)	
28 Days	5000 psi (34.5 MPa)	

Early Age Height Change: \_\_\_\_\_ % (ASTM C 1107)

Height Change of Moist Cured Hardened Grout: (ASTM C 1107)

Grade Classification (A, B, or C)	Actual % Change 1 Day	Actual % Change 3 Days	Actual % Change 14 Days	Actual % Change 28 Days
	%	%	%	%

C) Fluid (retained in mixer grout at manufacturers minimum recommended temperature)

Temperature as tested: \_\_\_\_\_ °F (°C) Water Added

Age as tested: \_\_\_\_\_ minutes

Consistency (10-30 seconds by flow cone required) as tested: \_\_\_\_\_ seconds

Yield as tested: \_\_\_\_\_ cubic foot (m<sup>3</sup>)

Compressive Strengths:

Time	Required Strength	Actual Strength
3 Days	2500 psi (17.2 MPa)	
7 Days	3500 psi (24.1 MPa)	
28 Days	5000 psi (34.5 MPa)	

Early Age Height Change: \_\_\_\_\_ % (ASTM C 1107)

Height Change of Moist Cured Hardened Grout: (ASTM C 1107)

Grade Classification (A, B, or C)	Actual % Change 1 Day	Actual % Change 3 Days	Actual % Change 14 Days	Actual % Change 28 Days
	%	%	%	%

D) Fluid (retained in mixer grout at manufacturers maximum recommended temperature)

Temperature as tested: \_\_\_\_\_ °F (°C) Water Added

Age as tested: \_\_\_\_\_ minutes

Consistency (10-30 seconds by flow cone required) as tested: \_\_\_\_\_ seconds

Yield as tested: \_\_\_\_\_ cubic foot (m<sup>3</sup>)

Compressive Strengths:

Time	Required Strength	Actual Strength
1 Day	1000 psi (6.9 MPa)	
3 Days	2500 psi (17.2 MPa)	
7 Days	3500 psi (24.1 MPa)	

Time	Required Strength	Actual Strength
28 Days	5000 psi (34.5 MPa)	

Early Age Height Change: \_\_\_\_\_ % (ASTM C1107)

Height Change of Moist Cured Hardened Grout: (ASTM C1107)

Grade Classification (A, B, or C)	Actual % Change 1 Day	Actual % Change 3 Days	Actual % Change 14 Days	Actual % Change 28 Days
	%	%	%	%

E) Flowable at 73.4 ± 5°F (23 ± 2.8°C)

Temperature as tested: \_\_\_\_\_ °F (°C) Water Added

Consistency (125-145 by 5 drops/3 seconds flow table) as tested: \_\_\_\_\_ seconds

Yield as tested: \_\_\_\_\_ cubic foot (m<sup>3</sup>)

Compressive Strengths:

Time	Required Strength	Actual Strength
1 Day	1000 psi (6.9 MPa)	
3 Days	2500 psi (17.2 MPa)	
7 Days	3500 psi (24.1 MPa)	
28 Days	5000 psi (34.5 MPa)	

Early Age Height Change: \_\_\_\_\_ % (ASTM C 1107)

Height Change of Moist Cured Hardened Grout: (ASTM C 1107)

Grade Classification (A, B, or C)	Actual % Change 1 Day	Actual % Change 3 Days	Actual % Change 14 Days	Actual % Change 28 Days
	%	%	%	%

F) Plastic at 73.4 ± 5°F (23 ± 2.8°C)

Temperature as tested: \_\_\_\_\_ °F (°C) Water Added

Consistency (100-125 by 5 drops/3 seconds flow table) as tested: \_\_\_\_\_ seconds

Yield as tested: \_\_\_\_\_ cubic foot (m<sup>3</sup>)

Compressive Strengths:

Time	Required Strength	Actual Strength
1 Day	1000 psi (6.9 MPa)	
3 Days	2500 psi (17.2 MPa)	
7 Days	3500 psi (24.1 MPa)	
28 Days	5000 psi (34.5 MPa)	

Early Age Height Change: \_\_\_\_\_ % (ASTM C 1107)

Height Change of Moist Cured Hardened Grout: (ASTM C 1107)

Grade Classification (A, B, or C)	Actual % Change 1 Day	Actual % Change 3 Days	Actual % Change 14 Days	Actual % Change 28 Days
	%	%	%	%

*I hereby certify that the above information submitted is actual physical laboratory test data obtained according to the requirements specified in the Qualification Procedure and Testing Procedure for the product.*

Person Responsible For Testing: \_\_\_\_\_ (Signature)  
 \_\_\_\_\_ (Print Name)

Laboratory Name and Address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Date Tests Were Conducted: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

**QUALIFICATION PROCEDURE  
FOR  
PREPACKAGED HYDRAULIC FAST-SET MATERIALS FOR  
PATCHING STRUCTURAL CONCRETE**

1. Scope

- 1.1 This document covers the physical requirements for prepackaged hydraulic mortars for use in structural concrete repairs and the procedure to be followed by producers in order to have their products included on MDOT's Qualified Products List.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation* - Submit a completed copy of MDOT Form 1022 (Qualified Products Evaluation) and Table 1, as required by this procedure to the MDOT address listed below:

Construction and Technology Division  
Materials Technology Group  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and the following information:

2.2.1 Substrate preparation

2.2.2 Bonding slurry requirements

2.2.3 Mixing and working times

2.2.4 Allowable temperature range for placement

2.2.5 Type of mixer recommended

2.2.6 Component ratios of mixed ingredients

2.2.7 Amount of coarse aggregate extension for deep patches and any incompatibility with aggregate types

2.2.8 Type and duration of curing required

2.2.9 Use of admixtures not included in the product.

- 2.3 *Evaluation Based on the Following* - Submit a report of tests conducted by an independent laboratory. The physical properties of the product must meet the requirements given in Table 1 of this procedure. Descriptions of the test methods are included in this procedure.

- 2.4 *Evaluation Scheduling* - MDOT will be allowed 40 days to review and verify the submittal.
- 2.5 *Sample Submittal* - Submit 50 pounds (25 kg) of prepackaged hydraulic fast-set mortar for testing to the address listed in 2.1.

### 3. Evaluation

- 3.1 The submitted information and test data will be reviewed for conformance to the specified requirements. If the product meets the requirements it will be included on the Qualified Products List. The submitter will be notified in writing concerning the result of the evaluation. MDOT reserves the right to verify submitted test results or re-evaluate a product at any time by conducting its own tests.
- 3.2 MDOT must be notified in writing of any change in the product formulation. Formulation changes require re-evaluation of the product.

### 4. Disqualification

- 4.1 A product may be removed from the Qualified Products List if any problem develops during mixing, casting, or with performance.

### 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected.

### 6. Testing Procedure

- 6.1 The following testing must be conducted by an independent testing laboratory.
- 6.2 *Extension with Coarse Aggregate* - All specimens will be cast from a uniform mix design, extended with coarse aggregate at the maximum rate recommended by the producer. However, the coarse aggregate extension shall not exceed 60 percent of the combined weights of the cementitious material plus the fine aggregate. The extension rate at which the aggregate is tested for qualification will be included on the Qualified Product List as the maximum aggregate extension. The recommended mix design must produce a material that is basically self-consolidating and self-leveling.
- 6.3 *Number of Specimens* - The physical properties at each specimen age will be the average of a minimum of three specimens.
- 6.4 *Curing of Specimens* - All specimens will be cured as recommended by the producer during the initial 24 hours. Subsequent curing will be air curing at laboratory temperature and humidity. Specimens will be cured in this manner until testing.
- 6.5 *Compressive Strength* - The compressive strength of the material will be determined by using 4 in. x 8 in. (102 mm x 203 mm) cylinders according to ASTM C 39.

- 6.6 *Slant Shear-Bond Strength* - Test material for bond strength according to ASTM C 882 and as modified below.
- 6.6.1 Prepare 3 in. or 4 in. (76 mm or 102 mm) diameter dummy sections using 517 pounds of cement per yd<sup>3</sup> (307 kg per m<sup>3</sup>) of concrete. Saw cut cylinders at 30° to result in a dummy section meeting the dimensional requirements given in Figure 1 of ASTM C 882. The 4 in. (102 mm) diameter dummy sections will be 4/3 times the dimensioning specified in Figure 1 of ASTM C 882. Grind the bond face of the specimen to a uniform texture with a No. 36 grit aluminum oxide grinding abrasive.
- 6.6.2 Place the dummy section in the lightly oiled 3 in. x 6 in. (76 mm x 152 mm) mold for 3 in. (76 mm) dummy section and 4 in. x 8 in. (102 mm x 203 mm) mold for 4 in. (102 mm) dummy section. Position the dummy section with the slant side up. Place the prepared hydraulic mortar in the mold in three layers of approximately equal volume. Rod the bottom layer as thoroughly and deeply as possible. Strike off the top of the specimen. Cover, cure, and test according to ASTM C 882.
- 6.7 *Modulus of Elasticity in Compression* - The modulus will be determined by using either 4 in. x 8 in. (102 mm x 203 mm) or 6 in. x 12 in. (152 mm x 305 mm) cylinders. Cast and test according to ASTM C 469. The cylinders will be loaded in compression and the strain read at a minimum of 5 equal intervals between 400 psi (2.8 MPa) and 2000 psi (13.8 MPa). The reported modulus will be the average of the results at these intervals. The specimens will be at least 28 days old at the time of testing.
- 6.8 *Thermal Coefficient of Expansion* - The specimens and length of comparator will conform to ASTM C 490. The specimens will be 2 in. x 2 in. x 11.25 in. (51 mm x 51 mm x 286 mm) with an effective gage length of 10 in. (254 mm). The coefficient will be determined from readings taken at 0°F (-18°C) and 104°F (40°C).
- 6.8.1 The specimens will be wrapped in an insulating material and conditioned for 96 hours at each temperature. If the measurements are taken at room temperature, they will be taken within 15 seconds of removal from the conditioning environment. If the specimen fails to return to its original length after the final measurement at laboratory temperature, the test will be repeated.
- 6.8.2 Use the following equation to determine the coefficient:
- $$\frac{L_{104} - L_0}{10 \times 104} = \text{in/in/}^\circ\text{F} \quad \left( \frac{L_{40} - L_{-18}}{254 \times 58} = \text{mm/mm/}^\circ\text{C} \right)$$
- 6.9 *Initial Plastic Shrinkage* - Use ASTM C 1090 to determine the initial plastic shrinkage.
- 6.10 *Surface Scaling* - Make two slab specimens 6 in. (150 mm) diameter x ¾ - 1 in. (20-25 mm) thick. Cure specimens for 28 days prior to initiation of testing. Install metallic tape dikes around the perimeter so that the dykes will pond water. The specimens will be conditioned in a freeze-thaw machine conforming to ASTM C 666, Procedure B, or subjected to daily freeze-thaw cycles. The daily cycle will consist of 16 to 18 hours in a freezing environment measuring 0°F to 16°F (-18°C to 9°C) followed by 6 to 8 hours at

laboratory temperature. The testing and ponding schedule of specimens undergoing either procedure will consist of:

- 6.10.1 Precondition specimens by ponding at room temperature for 24 hours with fresh water.
- 6.10.2 Subject specimens to 12 freeze-thaw cycles while ponded with fresh water.
- 6.10.3 Subject specimens to 24 freeze-thaw cycles while ponded with a three percent solution of sodium chloride (NaCl).
- 6.10.4 Subject specimens to 12 freeze-thaw cycles while ponded with fresh water.
- 6.10.5 The depth of the ponding solution will be maintained at approximately ¼ in. (7 mm). Each time the ponding solution is changed, all loose scale will be carefully removed, oven dried and weighed. After the scale has been removed, the slabs will be rinsed with water prior to ponding with the fresh solution.
- 6.10.6 The accumulated total of scale volume per unit area for each slab will be determined as follows:

$$\text{Scale} = \frac{\text{Dry Weight of Scale, g}}{\text{Dry Bulk Specific Gravity} \times \text{Ponded Area, cm}^2} = \frac{\text{cm}^3}{\text{cm}^2}$$

- 6.11 *Working Time* - The working time will be the time measured from the addition of the mix water to the point when the material is no longer workable. Conduct the test at standard laboratory conditions using a minimum of 1.5 quarts (1.5 liters) of material.

## 7. Physical Requirements

To be completed by independent testing laboratory:

**Table 1: Test Results with Maximum Coarse Aggregate Extension**

		2 hour	4 hour	28 days	50 F-T cycles
Compressive Strength, ASTM C 39 min. psi (MPa)	Required	2000 (13.8)	2500 (17.2)	4500 (31.0)	N/A
	Actual				
Slant Shear Bond Strength, ASTM C 882 mod., min., psi (MPa)	Required	250 (1.7)	375 (2.6)	1500 (10.3)	150 (10.3)
	Actual				
Modulus of Elasticity, Compression psi (MPa)	Required	N/A	N/A	[4.0 - 6.0] x 10 <sup>6</sup> (27,580 -41,370)	N/A
	Actual				
Thermal Coefficient of Expansion in/in/°F (mm/mm/°C)	Required	N/A	N/A	[5.0 - 8.0] x 10 <sup>-6</sup> ([9.0-14.4] x 10 <sup>-6</sup> )	N/A
	Actual				
Initial Plastic Shrinkage, max. (%)	Required	0.10	N/A	N/A	N/A
	Actual				
Surface Scaling, max (cm <sup>3</sup> /cm <sup>2</sup> )	Required	N/A	N/A	N/A	0.01
	Actual				
Min. Working Time (minutes)	Required	10	N/A	N/A	N/A
	Actual				

\* Please include actual mix design quantities used for obtaining these results.

*I hereby certify that the above information submitted is actual physical laboratory test data obtained according to the requirements specified in the Qualification Procedure and Testing Procedure for the product.*

Person Responsible For Testing: \_\_\_\_\_ (Signature)  
 \_\_\_\_\_ (PrintName)

Laboratory Name and Address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Date Tests Were Conducted: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

**QUALIFICATION PROCEDURE  
FOR  
PENETRATING WATER REPELLENT TREATMENT FOR  
STRUCTURAL CONCRETE SURFACES**

1. Scope

- 1.1 This document covers the physical requirements for penetrating water repellent treatments for structural concrete surfaces and the procedures to be followed by producers in order to have their products included on MDOT's Qualified Products List for a period of three years.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below:

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as the independent laboratory test data required. **This independent test data must be either in a report written by the independent laboratory or in a letter on their letterhead.**
- 2.3 *Evaluation Based on the Following Standards* - Submit one quart (one liter) to be evaluated by the MDOT Materials Technology Group for compliance with the physical requirements in this document (except those required from an independent testing laboratory). The canister shall be labeled with the following: name of product, lot number, shelf life, and coverage rate.
- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of the Department.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements, it will be included on the Qualified Products list. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of product materials, manufacturing, or plan dimension changes made by either the Department or the product manufacturer.

#### 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply to requalification of the product at the expiration of the qualification period.

#### 6. Testing Procedure

- 6.1 The following testing must be conducted by an independent testing laboratory.
- 6.2 *Reduction of Chloride Intrusion* - This shall be tested according to NCHRP Report 244, series II with a five day air drying period.
- 6.3 *Reduction of Water Absorption* - This shall be tested according to NCHRP Report 244, series II with a five day air drying period.
- 6.4 *Submittal of Independent Laboratory Data* - This independent test data must be written either by the independent laboratory or in a letter on their letterhead.
- 6.5 *Scaling Resistance* - The slab specimens shall be 6 inches (150 mm) in diameter by  $\frac{3}{4}$  to 1 inch (19 to 25 mm) thick and be made of concrete with the mix design stated below. Metallic tape dikes sealed with silicone caulk shall be installed around the perimeter such that the dikes will pond water. The specimens shall be conditioned in a freeze-thaw machine conforming to ASTM C 666, Procedure B, or subjected to a daily freeze-thaw cycle consisting of 16 to 18 hours in a freezing environment of 0 to 16°F (-17 to -9 °C) followed by 6 to 8 hours at laboratory temperature. The ponding schedule for both procedures shall consist of a 24-hour preconditioning with the specimens ponded with fresh water. The depth of the ponding liquid shall be maintained at approximately  $\frac{1}{4}$  inch (6.4 mm). Each time the ponding solution is changed, all loose scale shall be very carefully removed, oven dried, and weighed. After the scale has been removed, the slabs shall be rinsed with water prior to ponding with a fresh solution. The specimen shall be cured as specified for 28 days prior to applying the sealant at the manufacturers recommended coverage rate. The sealant shall then be allowed to air-dry for three days before beginning the testing.

The accumulated total of scale volume per unit area for each slab shall be determined as follows:

$$\text{Scale Volume} = \frac{\text{Dry Weight of Scale, gm}}{\text{Dry Bulk Sp Gr of Concrete, gm/mm}^3 \times \text{Ponded Area, mm}^2} = \frac{\text{mm}^3}{\text{mm}^2}$$

- 6.6 *Depth of Penetration* - This shall be measured by breaking a treated specimen of the same size as was used for scaling resistance testing. Three measurements shall be taken by viewing the cross-section at the break under a microscope with an eyepiece having a graduated scale. The microscope shall be adjusted until 0.04 inch (1 mm) equals some convenient amount on the graduated scale. Five measurements at approximate equal spacings across the cross-section shall be taken. The reported depth of penetration shall be an average of these five measurements.
- 6.7 *Concrete Mix Design* - The concrete mix to be used for MDOT testing shall be a 7-sack mix having a design strength of 4500 psi (31 MPa), air content of 5 to 8 percent, and slump of 4 to 6 inches (100 to 150 mm). The coarse aggregate shall be a Michigan Series 26A limestone or equivalent. No admixtures other than an air-entraining agent shall be used.
- 6.8 *Curing of Concrete Specimens* - The concrete specimens shall be cured for 14 days in a 100 percent humidity environment and then 14 days at ambient laboratory conditions.

**TEST REPORT SHEET  
FOR  
PENETRATING WATER REPELLENT TREATMENT FOR  
STRUCTURAL CONCRETE SURFACES**

To be completed by an independent testing laboratory:

Name of Product: \_\_\_\_\_

	Result	Spec
Independent laboratory data furnished?		Yes
Federal VOC compliant?		Yes
Reduction of Chloride Intrusion, %		85 min.
Reduction of Water Absorption, %		85 min.
Scaling Resistance, mm <sup>3</sup> /mm <sup>2</sup>		0.05 max.
Depth of Penetration, inches (mm)		0.1 min.(2.3)

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

*I hereby certify that the above information submitted is actual physical laboratory test data obtained according to the requirements specified in the Qualification Procedure and Testing Procedure for the product.*

Person Responsible For Testing: \_\_\_\_\_ (Signature)  
 \_\_\_\_\_ (Print Name)

Laboratory Name and Address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Date Tests Were Conducted: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

**QUALIFICATION PROCEDURE  
FOR  
BUSHINGS FOR PINS AND LINK PLATES  
IN STRUCTURAL STEEL CONSTRUCTION**

1. Scope

- 1.1 This document covers the physical requirements for bushings for pins and link plates and the procedure to be followed by producers in order to have their products included on MDOT's Qualified Products List for a qualification period of five years.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below. Portions of the physical requirements report sheet that may require test data to be furnished by the submitter must be completed in full.

Structural Fabrication Unit  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-1235

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc. of the bushings for pins and link plates submitted.
- 2.3 *Evaluation Based on the Following Standards* - Evaluations will be based on a case by case basis.
- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of product materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer.

## 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the qualification period.

## 6. Testing Procedure

- 6.1 No testing is required.

## 7. Physical Requirements

Bearing Capacity	psi (kPa)
Static	30,000 (206,850)
Dynamic	15,000 (103,425)
PV Intermittent	50,000 (344,750)
PV Continuous	10,000 ( 68,950)

Fibers: Nomex/Teflon

Temperature Range: -225 to 320°F (-143 to 160°C)

Friction: .02 to .20

Shaft Finish: 8 to 16 rms

Shaft Clearance:

Shaft Diameter	Clearance
dia. ≤ 5 inch (127 mm)	0.20 inch (0.50 mm)
dia. > 5 inch (127 mm)	0.30 inch (0.80 mm)

**QUALIFICATION PROCEDURE  
FOR  
ADHESIVE SYSTEMS FOR STRUCTURAL ANCHORS AND LANE TIES**

1. Scope

- 1.1 This document covers the procedure to be followed by producers to have an Adhesive Anchor System included on the MDOT's Qualified Products List.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - There is no form required for submittal; however, information about the product shall be submitted to the following MDOT address:

Structural Research Unit  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5707

- 2.2 *Product Data Sheets* - Submit two copies of product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc.

2.2.1 Include product literature describing the product's use and other pertinent information such as mixing, working times and component ratios of mixed ingredients. Also include spacing and edge distance reduction factors, anchor type, application, packaging, limitations, and installation details.

2.2.2 Submit product safety data sheets.

- 2.3 *Evaluation Based on the Following Standards* - The resin adhesive anchor system must demonstrate its ability to develop 125 percent the yield strength of an ASTM A 307 bolt and Grade 60 (400 MPa) reinforcing steel in tension at a maximum embedment of 9d (9 times the nominal bolt diameter) for bolt diameters  $\frac{3}{8}$  to  $\frac{7}{8}$  inches (9.52 to 22.22 mm) and at a maximum embedment of 12d (12 times the bar diameter) for reinforcing steel sizes #4 to #8 (metric #13 to #25). The adhesive anchor must also demonstrate its ability to develop the yield strength of the bolt and reinforcing steel when subjected to shear at these embedment depths. The tensile stress area of the bolt (nominal area for reinforcing steel) will be used when determining the yield load. Test results, in accordance with ASTM E 488, are required from an independent laboratory for verification of the tensile and shear capacities.

2.3.1 Long term load (creep) tests should be performed in accordance with ASTM E 1512 or ICC-ES AC308. These results shall be submitted prior to acceptance.

2.3.2 Resin adhesive anchor systems, when subjected to tension, shall develop 125 percent of the yield strength of the reinforcing steel or bolt at less than or equal to  $\frac{1}{16}$  inch (1.60 mm) displacement in 4000 psi (28 MPa) concrete.

- 2.3.3 Submit a minimum of 10 ounces (300 cubic centimeters) of epoxy and/or three capsules per anchor size  $\frac{1}{2}$  and  $\frac{7}{8}$  inch (12.70 and 22.22 mm), a dispenser, four nozzles and any special equipment necessary for installation and evaluation by MDOT.
3. Evaluation
  - 3.1 The submitted information and test data will be reviewed for conformance to the specified requirements. The product's susceptibility to corrosion, method of load transfer, installation procedure, workmanship, reliability and requirements specific to a particular design will also be evaluated. If the product meets the requirements, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. The MDOT reserves the right to verify submitted test information or re-evaluate a product anytime by conducting its own tests.
4. Disqualification
  - 4.1 A product may be immediately removed from the Qualified Products List should any problem develop related to installation or performance of the product. A product may also be removed due to specification changes made by either MDOT or the product manufacturer.
5. Requalification
  - 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected.

## QUALIFICATION PROCEDURE FOR MECHANICAL EXPANSION ANCHORS

### 1. Scope

- 1.1 This document covers the procedure to be followed by producers in order to have a mechanical expansion anchor included on the MDOT's Qualified Products List.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - There is no form required for submittal. However, information about the product can be submitted to the following MDOT address:

Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5707

- 2.2 *Product Data Sheets* - Submit a copy of product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc.

- 2.2.1 The producer shall include verified test results from an independent testing laboratory including static load tests for tension and shear, testing in accordance with ASTM E 488.

- 2.3 *Evaluation Based on the Following Standards* - Submit three mechanical expansion anchors per size for evaluation by MDOT.

- 2.3.1 Mechanical expansion anchors shall meet the following proof tensile loads (125 percent yield strength x tensile stress area) and shear loads (yield strength x tensile stress area) when attached to a 4,000 psi hardened concrete:

125% Yield (Load)		Bolt Diameter, inch				
		3/8"	1/2"	5/8"	3/4"	7/8"
Tension (Pull-out)	lbf	3,510	6,390	10,170	15,030	20,790
Shear	lbf	2,808	5,112	8,136	12,024	16,632

- 2.3.2 Mechanical expansion anchors shall develop 50 percent of the proof tensile load at less than or equal to 1/16 inch displacement.

- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal must be received by MDOT no later than January 15 to be included in that years evaluation. Addition of new products to the

Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. The products susceptibility to corrosion, method of load transfer, installation procedure, workmanship, reliability, and requirements specific to a particular design, will also be evaluated. If the product meets the requirements it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problem develop related to installation or performance of the product. A product may also be removed due to specification changes made by either MDOT or the product manufacturer.

### 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected.

**QUALIFICATION PROCEDURE  
FOR  
MECHANICAL REINFORCEMENT SPLICING**

1. Scope

- 1.1 This document covers the procedure to be followed by producers in order to have a mechanical reinforcement splice approved for MDOT use.

2. Submittal Procedure

- 2.1 *Product Data Sheets* - Submit a copy of product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc. of the sample submitted to the MDOT address listed below:

Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, Michigan 48909  
Telephone: (517) 322-5707

- 2.2 *Report of Tests* - The producer shall include test results from an independent testing laboratory demonstrating that the mechanical reinforcement splice meets the following criteria:

2.2.1 All splices tested shall develop a tensile strength of 125 percent of the reinforcing bar's yield strength.

2.2.2 All splices tested shall develop fatigue strength of 12,000 psi (83 MPa) tension at greater than 1,000,000 cycles.

2.2.3 To be considered for "High Strength" splices, all splices tested shall conform to the following criteria:

2.2.3.1 Splices shall develop a tensile strength of 150 percent of the reinforcing bars yield strength.

2.2.3.2 Splices shall develop a fatigue strength of 18,000 psi (124 MPa) tension at greater than 1,000,000 cycles.

2.2.3.3 Slices shall slip no more than 0.01 inch for bar sizes up to #14, and no more than 0.03 inch for bar size #18, when subjected to slip testing in accordance with ASTM 1034.

2.3 *Sample Submittal*

- 2.3.1 The producer shall provide splices for verification testing by MDOT in order to verify independent test data. When special equipment is not required to prepare the splice, the producer shall provide the samples unassembled with installation

instructions. If special equipment is required to prepare the splice, arrangements shall be made where a representative of MDOT can witness the assembly of the test samples. If this is not feasible, the producer shall prepare the test samples and supply information on the procedure used to prepare each splice. The following number of test samples shall be provided:

NOTE: MDOT currently accepts soft-converted metric reinforcement sizes.

Small Size - Submit 4 samples; minimum size equals #4 (#13) or smallest splice available if larger than minimums shown here. A combination of small size bars can be submitted.

Medium Size - Submit 4 samples; a combination of #3, #7 or #8 (#9, #22, or #25) bars can be submitted.

Large Size - Submit 4 samples; maximum size equals #11 (#36) or largest splice available if smaller than the maximums shown. A combination of large bar sizes may be submitted.

Test sample bars shall have 12 inches (300 mm) exposed length beyond the prepared splice. The bars shall be Grade 60 psi (400 MPa) and supplied by the producer.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. The product will also be reviewed for general workmanship, corrosion protection, ease of installation, and any requirements specific to a given design. Please note: Only splices having collinear axes after splicing will be approved, i.e., offset bar splices will not be accepted. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or reevaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately disqualified from MDOT use should any problem develop related to installation or performance of the product. A product may also be removed due to specification changes made by either MDOT or the product manufacturer.

### 5. Requalification

- 5.1 A product that has been disqualified will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected.

**QUALIFICATION PROCEDURE  
FOR  
EMBEDDED GALVANIC ANODES**

1. Scope

- 1.1 This document covers the procedure manufacturers must follow to have embedded galvanic anodes included on MDOT's Qualified Product List.

2. Product Submittal

- 2.1 *Product Literature* - Submit product literature describing the anode's use, restrictions (if any) on the patch material surrounding the anode, maximum anode spacing, and minimum service life. Include additional pertinent information, such as manufacturer's name and address, manufacturer's trade name, model number, etc., to the MDOT address listed below:

Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5655

- 2.2 *Product Data* - Submit product data documenting the quantity of zinc in each anode, as well as the components of the material encasing the anode.
- 2.3 *Product Sample* - The manufacturer shall submit a sample of the product to the address listed above.
- 2.4 The submitted information will be reviewed and additional samples may be requested to test for compliance with the specified requirements. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

3. Performance Evaluation

- 3.1 The performance of the embedded galvanic anodes will be evaluated by laboratory or field installation and monitoring the product in an MDOT selected test site.
- 3.1.1 The manufacturer shall provide the labor, tools, materials and equipment necessary for proper installation of the embedded galvanic anodes into the test site. This includes, but is not limited to, the anode lead wires and junction box with access for monitoring of the performance of the anodes over the evaluation period.
- 3.1.2 MDOT shall provide the labor, tools, materials and equipment necessary to complete the patch.
- 3.2 The embedded galvanic anodes at the test site will be monitored on a regular basis for a period of twelve months.

- 3.3 Alternatively, in-service performance information can be submitted from a third party independent testing facility. The test must be performed over a minimum six month period, indicate the steady state current requirements as outlined below, and provide the estimated service life.

#### 4. Acceptance Requirements

- 4.1 The embedded galvanic anodes must meet the following requirements to be approved for use on MDOT projects:
  - 4.1.1 *Field Performance* - The anodes are required to provide a protective current equal to or greater than 0.4 mA each after 90 days.
  - 4.1.2 *Service Life* - The anodes must provide a minimum of ten years service life.
- 4.2 Provisionary acceptance of the embedded galvanic anodes will be granted after 90 days if the anodes meet the requirements above. Full acceptance of the product will be granted after twelve months of satisfactory performance.

#### 5. Disqualification

- 5.1 A product may be immediately disqualified from MDOT use should any problem develop related to installation or performance of the product. A product may also be removed due to specification changes made by either MDOT or the product manufacturer.

#### 6. Requalification

- 6.1 A product that has been disqualified will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. A new trial installation may be required.

**QUALIFICATION PROCEDURE  
FOR  
SEALANT FOR PERIMETER OF BEAM PLATES**

1. Scope

- 1.1 This document covers the physical requirements for sealant for perimeter of beam repair and the procedures to be followed by producers in order to have their products included on MDOT's Qualified Products List for a qualification period of three years.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below.

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as equipment needed to install, and installation procedures of, the sealant submitted.

- 2.3 *Evaluation Based on the Following Standards* - Submit one 28-ounce (850 mL) or two 10-ounce (300 mL) cartridges to be evaluated by the MDOT Materials Technology Group for compliance with the specifications set forth in this document. Complete, sign, and date the Physical Requirements in Section 7. Note: Testing does not have to be conducted by an independent laboratory.

- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. If the product meets the requirements, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of products

materials, manufacturing or plan dimension changes made by either MDOT or the product manufacturer. The manufacturer will receive notification including reasons for disqualification.

## 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

## 6. Testing Procedure

- 6.1 *Material* - The sealant shall be a one-component elastomeric polyurethane sealant (Federal Specification TT-S-00230C, Type 2, Class A or B; ASTM C 920, Type S, Grade NS, Class 25), that does not require a primer for proper bonding to a painted steel beam. The sealant shall be packaged in cartridge form.
- 6.2 *Sample Preparation* - Cure the sealant samples for 21 days at  $73 \pm 3^{\circ}\text{F}$  ( $23 \pm 2^{\circ}\text{C}$ ) and  $50 \pm 5$  percent relative humidity.
- 6.3 *Flow* - The flow shall be tested according to ASTM C 639 and shall not be more than 0.3 inches (8 mm).
- 6.4 *Solids Content* - The solids content shall be tested according to ASTM D 2822 (Subsection 9.2). The sealant shall be a minimum of 90 percent solids.
- 6.5 *Peel Strength* - The peel strength shall be tested according to ASTM C 794 and shall be more than 7.5 pounds per inch (1.33 newtons per mm) of width. Two test specimens shall be prepared on panels painted with a urethane top coat.

7. Physical Requirements

	Result	Spec
Flow, inches (mm)		0.3 (8) max.
Solids Content, %		90 min.
Peel Strength, pounds per inch (newtons per mm) of width		7.5 (1.33) min.

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Material: **PASSES** or **FAILS** (circle one)

*I certify to the accuracy of the above physical requirements test results and that testing was conducted in compliance with the procedures stated in Section 6, and that the material complies with the specification(s) stated in Section 6.1.*

\_\_\_\_\_ (Name) \_\_\_\_\_ (Date)

\_\_\_\_\_ (Title)

\_\_\_\_\_ (Company)

## QUALIFICATION PROCEDURE FOR LOW DUST ABRASIVES

### 1. Scope

- 1.1 This procedure describes the requirements for an abrasive to be placed on MDOT's Prequalified Materials List for Requirements for Approval of Low Dust Abrasives.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below.

Structural Section - Paint Systems  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5722

- 2.2 *Product Data Sheets and Material Safety Data Sheets* - Submit the Product and Material Safety Data Sheets for each product submitted for evaluation.

2.2.1 A 50-pound (25 kg) sample must be submitted.

- 2.3 *Evaluation Based on the Following Standards* - The abrasive will be listed on a generic basis as either medium or low dust in the SSPC Painting Manual, Volume 1 or certified by the California Air Resources Board (CARB) on a trade name basis.

### 3. Evaluation

- 3.1 The abrasive will be evaluated by MDOT for embedment into the steel, and the surface profile produced. If the product meets the requirements, it will be included on a Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. The Michigan Department of Transportation reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of product materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer.

### 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected.

The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

## 6. Physical Requirements

- 6.1 It will be listed on a generic basis as a medium or low dust abrasive in the Steel Structures Painting Manual, Volume 1, or it is certified by the CARB on a trade name basis, and/or a field evaluation.
- 6.2 It will have a gradation such that the abrasive will produce a uniform profile of 1 to 2.8 mils (25-70 microns), as measured with the extra course Testex Replica Tape.
- 6.3 The material will be listed on a generic basis in the Steel Structures Painting Manual, Volume 1, as an abrasive with <1 percent by weight free silica or certified results of the analysis for free silica indicating <1 percent by weight free silica. The free silica content will be determined by the use of infrared spectroscopy or by other analytical procedures, such as wet chemical or x-ray diffraction analyses.
- 6.4 The manufacturer must certify and submit documentation that the abrasive, before blasting, contains less than the maximum allowable limit for each of the elements listed in the following table:

ELEMENT	MAXIMUM ALLOWABLE LIMIT
Arsenic	2.5 ppm
Barium	50 ppm
Cadmium	0.5 ppm
Chromium	2.5 ppm
Lead	0.5 ppm
Mercury	0.1 ppm
Selenium	0.5 ppm
Silver	2.5 ppm

- 6.5 Technical information regarding the above requirements, Product and Materials Safety Data Sheets and 50 pounds (25 kg) samples, will be submitted to:

Structural Section - Paint Systems  
 Construction and Technology Division  
 8885 Ricks Road  
 P.O. Box 30049  
 Lansing, MI 48909  
 Telephone: (517) 322-5722

- 6.6 The material will be evaluated by MDOT as to its dusting characteristics, embedment into the steel, and the surface profile it produced. If the product is judged to perform satisfactorily, it will be approved to be on the Qualified Products List.
- 6.7 Products may be deleted from the Qualified Products List by MDOT at any time they fail to meet any of the above requirements.

## QUALIFICATION PROCEDURE FOR DETECTABLE WARNING SURFACES

### 1. Scope

- 1.1 This document covers the requirements for detectable warning surfaces to be placed on the Qualified Products List. The qualified product list for detectable warning surfaces includes cast-in-place and surface applied products.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the Michigan Department of Transportation address listed below.

Materials Technology Unit  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-6448

- 2.2 *Product Information* - Include product information as listed below:

2.2.1 *Product Data Sheets* - Enclose product literature for detectable warning surfaces describing the use, restrictions, cost and anticipated benefit to MDOT's transportation system.

2.2.2 *Supporting Evaluation* - Enclose a list of other state DOT's or agencies (contact person, telephone number) who have approved your material for use.

2.2.3 *Sample Specification* - Enclose a sample specification for product usage.

- 2.3 *Evaluation Based on the Following Standards:*

2.3.1 Any product to be considered for this Qualified Products List must meet the requirements of the Americans with Disabilities Act and must conform to MDOT Standard Plan R-28 Series.

2.3.2 If a company has a new product that it wants included in the Qualified Products List, it must provide a trial installation in the State of Michigan. The company must notify the MDOT contact listed in Section 2.1 of this procedure prior to installation of the product.

### 3. Evaluation

- 3.1 *Field Evaluation:*

3.1.1 The submitter must arrange for a trial installation of its product in the State of Michigan. The supplier must be on-site for installation of the product. A field

evaluation of the product will be scheduled after the product has been in service for one year.

- 3.1.2 The product will be evaluated during installation and after it has been in service for one year. If the product has performed satisfactorily and has retained a minimum of 95 percent of its truncated domes, the field evaluation will be considered successful.
  - 3.2 The submitted information and field evaluation will be reviewed for conformance to the specified requirements. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to re-evaluate a product at any time by conducting its own tests.
4. Disqualification
  - 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of product materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer. The manufacturer will receive notification including reasons for disqualification.
5. Requalification
  - 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request, along with the acceptable evidence that the problems causing the disqualification have been corrected.

## QUALIFICATION PROCEDURE FOR FLUID APPLIED PAVEMENT MARKING MATERIALS

### 1. Scope

- 1.1 This document covers the requirements for fluid pavement marking materials to be placed on MDOT's Qualified Products List.
- 1.2 The procedure covers:
- Longitudinal Lines - 1 Year Product
  - Longitudinal Lines - 3 to 5 Year Product
  - Special Markings - 3 to 5 Year Product (Legends, Symbols, Arrows, Crosswalks, and Stop Bars)

### 2. Submittal Procedure

- 2.1 The Manufacturer must provide a report from the pavement marking material category of the National Transportation Product Evaluation Program (NTPEP) for the submitted product(s). Northern (snow plow) site NTPEP data is required for fluid applied pavement marking materials. For a one year product, the NTPEP report must have a minimum of nine months of data and include one winter plowing season. For a three to five year product, the NTPEP report must have a minimum of twenty-four months of data.
- 2.2 Send the results from NTPEP, product data sheets, and other pertinent information to:
- MDOT Pavement Marking Engineer  
Traffic Operations Section  
425 West Ottawa Street  
P.O. Box 30050  
Lansing, MI 48909
- 2.3 The NTPEP report must provide retroreflectivity and product durability data. The material thickness used for NTPEP evaluation of sprayable thermoplastic may exceed 35 mils. Fluid pavement markings must have the following minimum properties on hot mix asphalt and Portland cement concrete to qualify for MDOT field evaluation:

			White	Yellow
1 yr Product	Skip Readings	Initial retroreflectivity	375 mcd	200 mcd
		9 month retroreflectivity	120 mcd	80 mcd
	Wheel Readings	Durability - 12 month	6	6
3 to 5 yr Product	Skip Readings	Initial retroreflectivity	400 mcd	280 mcd
		24 month retroreflectivity	175 mcd	120 mcd
	Wheel Readings	Durability - 24 month	8	8

### 3. Evaluation

- 3.1 The submitted NTPEP report will be reviewed by MDOT's Pavement Marking Business Team (PMBT).

If the product meets the requirements specified in Section 2.3, a sample amount of product and location for installation will be determined by the PMBT for field evaluation. The sample material will be placed according to MDOT specifications. The cost of the material will be negotiated between the Manufacturer and the Contractor.

Products must be heavy metal free.

Ease of application will be assessed and visual inspection of the material will be performed during the field evaluation. The following requirements must also be met:

Longitudinal lines - 1 Year Product:

Retroreflectivity readings for longitudinal lines must be 100 millicandellas for white and 60 millicandellas for yellow after one winter. Retroreflectivity measurements will be taken by MDOT.

Longitudinal lines - 3 to 5 Year Product:

Retroreflectivity readings for longitudinal lines must be 250 millicandellas for white and 150 millicandellas for yellow after one winter. Retroreflectivity measurements will be taken by MDOT.

Special Markings - 3 to 5 Year Product (Legends, Symbols, Arrows, Crosswalks, and Stop Bars):

MDOT requires 90 percent of the marking to be fully adhered to the pavement after one winter.

MDOT reserves the right to verify submitted test information or re-evaluate a product at any time.

- 3.2 Once the material has been in place for an entire winter, the PMBT will review the material a second time. Approval from the PMBT will result in the product being added to the Qualified Products List. The Manufacturer will be notified in writing concerning the results of the evaluation.
- 3.3 Every January, the Manufacturer must submit the following statement: “ \_\_\_\_\_ (Manufacturer name) certifies that the composition and manufacture of \_\_\_\_\_ (product name) has not changed since its last certification.” This certification statement must be signed by a designated representative of the Manufacturer.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance of the material. The Manufacturer will receive written notification, including reasons for disqualification.

#### 5. Requalification

- 5.1 A product which has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request from the Manufacturer, along with the acceptable evidence that the problems causing the disqualification have been corrected.

## QUALIFICATION PROCEDURE FOR ADMIXTURES FOR CONCRETE

### 1. Scope

- 1.1 The Construction and Technology Division of MDOT will authorize manufacturers to ship approved products to MDOT projects for immediate incorporation into the work.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation* - The manufacturer will submit the following at the time of application for addition to the Qualified Products List and once every seven years thereafter, to the MDOT address listed below:

- 2.1.1 Full ASTM C 260 Testing Report or Full ASTM C 494 Testing Report, see Section 2.2.

The results must be from tests performed no greater than two years prior to submittal. Use the summary sheets located in the appendix to submit all Full ASTM test results in both hard copy and electronically (use the contact below to receive an electronic copy).

- 2.1.2 Certification and Product Data, Submit certification and product data as specified in Section 3.1 of this procedure.

- 2.1.3 Sample, see Section 3.2.

- 2.1.4 Abbreviated ASTM C 260 Testing Report or Abbreviated ASTM C 494 Testing Report, see Section 4.

The results must be from tests performed no greater than 12 months prior to submittal. Use the summary sheets located in the appendix to submit all Abbreviated ASTM test results in both hard copy and electronically (use the contact below to receive an electronic copy).

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Evaluation Based on the Following Standards* - ASTM C 260 will be used to evaluate air-entraining admixtures for concrete. ASTM C 494 will be used to evaluate chemical admixtures for concrete. Provide a report including the results of testing the admixture according to the applicable specification. The report must include a description of all materials used, the numerical results of all required tests on both plastic and hardened concrete and a comparison with the specification requirements.

- 2.3 *Referenced Documents*

### 2.3.1 ASTM Standards

- C 192 Test Method for Making and Curing Concrete Test Specimens in the Laboratory
- C 260 Standard Specification for Air-Entraining Admixtures for Concrete
- C 494 Standard Specification for Chemical Admixtures for Concrete
- C 233 Standard Test Method for Air-Entraining Admixtures for Concrete
- C 403 Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
- C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates

### 2.3.2 Standard Specifications for Construction, Section 903

## 3. Product Data

3.1 The manufacturer will submit, at the time of application for addition to the Qualified Products List and every January thereafter, the following product data and certification:

3.1.1 Manufacturer name

3.1.2 Product name

3.1.3 Admixture type

3.1.4 Recommended dosage or dosage range

3.1.5 Chloride ion content, percent

3.1.6 pH

3.1.7 Specific gravity

3.1.8 Total solids, percent

3.1.9 Indication if admixture is lignin (lignosulfonate) based

3.1.10 Certification statement - "The \_\_\_\_\_ (manufacturer name) certifies that the admixture conforms to the requirements of \_\_\_\_\_ (ASTM C 260 for air-entraining admixtures or ASTM C 494 for chemical admixtures)." This certification statement will be signed by a designated representative of the manufacturer.

3.2 Sample - Furnish a one-quart sample of the material to the address listed in Section 2.

## 4. Testing Procedure and Evaluation for Abbreviated ASTM Testing (Local Cement Testing)

4.1 *General Test Procedure for Abbreviated Evaluation* - This testing is to be performed by an independent laboratory conforming to ASTM C 1077.

4.1.1 Evaluate an air-entrained concrete containing the specific admixture against an

air-entrained reference concrete not containing the admixture. If the product being submitted for approval is an air-entraining (AE) admixture, make the reference concrete using a vinsol resin AE admixture.

- 4.1.2 General - Make the reference batch and corresponding test batch on the same day. The reference batch should usually be made first to prevent any carry-over of the admixture under test. One reference batch and one test batch for a given set of conditions will be adequate unless duplicates are requested. One reference batch may serve as basis of comparison for several test batches made using different admixtures, dosage rates, etc., as long as all are made with the same cement(s). Submit summary report of test results, with data sheets attached.
  - 4.1.3 Use the summary sheets located in the appendix to submit all Local Cement test results in both hard copy and electronically (use the contact in Section 2 to receive an electronic copy).
  - 4.1.4 Test admixtures at the minimum dosage rate to be reported on the Qualified Products List.
- 4.2 *Mix Properties*
- 4.2.1 Cement Content - 517 lb/yd (MDOT Grade P2 or equivalent).
  - 4.2.2 Air Content -  $6.5 \pm 1.5$  percent for control. Air content of test concrete will be within 0.5 percent of control.
  - 4.2.3 Slump -  $3\frac{1}{2} \pm \frac{1}{2}$  inch for the control and the test concrete. Slump of test concrete will be within 1 inch of control.
  - 4.2.4 High Range Water Reducing Admixtures - Mix design for test batches will be redesigned for less water than reference batches.
- 4.3 *Materials Requirements*
- 4.3.1 Cement - Type I Portland cement. Use three brands of cement (in common use in Michigan) individually, or as specified for the individual testing.
  - 4.3.2 Aggregate - 2NS and 6A. Use moist aggregates of known moisture content.
  - 4.3.3 Materials should be of such temperature as to produce a concrete having a temperature of  $68 \pm 4^{\circ}\text{F}$ .
- 4.4 *Mixing* - Add all solid materials to mixer and a portion of the water. Add the admixtures with some of the water immediately at the start of mixing, except high range water reducing admixtures will be added approximately 90 seconds after start of mixing. For C 494 testing, add air-entraining admixture separately from chemical admixtures.
- 4.4.1 Mix for three minutes, allow concrete to rest for three minutes, then remix for two minutes.
- 4.5 *Tests and Properties*

- 4.5.1 Slump - all batches.
- 4.5.2 Air Content - all batches.
- 4.5.3 Compressive Strength - Test a minimum of two cylinders 4 x 8 or 6 x 12 inches for each test age. Test types A, C, D, E, and air-entrainers at 3 days, 7 days and 28 days. Test types F and G at 1 day, 3 days, 7 days and 28 days.
- 4.5.4 Water Content - Expressed as water-cement ratio by mass. Use the net water in the batch (total water, less water absorbed by aggregates).
- 4.5.5 Time of Set - ASTM C 403, for retarders and accelerators, otherwise as instructed.
5. Mid Range Water Reducers and Retarding Mid Range Water Reducers
- 5.1 Section 1 through 4 applies to mid range admixtures except as modified below.
- 5.2 Submit the full ASTM C 494 report required by Subsection 2.2 as a Type A or F for normal set or as a Type D or G for retarding.
- 5.3 Submit a report as required by Subsection 4.1 General Test Procedure for Abbreviated Evaluation. Testing must indicate conformance with the physical requirements listed in Table 1. Test admixture at the minimal dose for the mid range water reducer dosage range.
- 5.4 Reduce water of the control batch by at least 9 percent.
- 5.5 Time of Set - ASTM C 403 for Retarders. Retarding mid-range water reducers must conform to the time of setting requirements given in Table 1 of ASTM C 494 for Type D.

**Table 1**  
Physical Requirements  
Concrete with Mid Range Water Reducer

	Fresh Concrete	1 Day	3 Days	7 Days	28 Days
Water Content, max % of control	91	N/A	N/A	N/A	N/A
Slump, inches	3 - 4	N/A	N/A	N/A	N/A
Air Content, Control Batch, %	5 - 8	N/A	N/A	N/A	N/A
Air Content, Test Batch, %	± 0.5 of control batch	N/A	N/A	N/A	N/A
Compressive Strength, min % of control	N/A	120	115	115	110
Flexural Strength, min % of control	N/A	N/A	100	N/A	100

## 6. Product Review

- 6.1 *Acceptance* - The submitted information will be reviewed for conformance to the specified requirements. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.
- 6.2 *Disqualification* - A product may be removed immediately from the Qualified Products List if any field performance problems develop related to product material or manufacturing.
- 6.3 *Requalification* - A product which has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with acceptable evidence the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for re-qualification of the product.

**QUALIFICATION PROCEDURE  
FOR  
EPOXY COATING FOR STEEL REINFORCEMENT**

1. Scope

- 1.1 This document covers the physical requirements for epoxy coatings for steel reinforcement and the procedure to be followed by the producers to have their products included on MDOT's Qualified Product List.

2. Submittal Procedure

- 2.1 Submit the following criteria to the MDOT address listed below.

Structural Section - Paint Systems  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5722

- 2.2 *Product Data Sheets* - Include product literature describing the products use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc.

- 2.3 *Evaluation Based on the Following Standards* - The testing is conducted by an independent testing agency to ensure that the product meets ASTM A 775 and MDOT's requirements.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product anytime by conducting its own tests.

4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance results from product materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer.

5. Requalification

- 5.1 A product disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

6. Testing Procedure

- 6.1 The testing procedure is conducted by an independent testing agency, who in return verifies that all of MDOT's requirements are met.

## QUALIFICATION PROCEDURE FOR SHEAR CONNECTOR STUDS

### 1. Scope

- 1.1 This document covers the physical requirements for stud shear developers and the procedure to be followed by producers in order to have their products included on MDOT's Qualified Products List for a qualification period of two years.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below:

Structural Fabrication Unit  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-1235

- 2.2 *Product Data Sheets* - Include manufacturer's name and address, trade name, model number and design drawings, and any other pertinent information.

- 2.3 *Evaluation Based on the Following Standards* - Finished studs shall be of uniform quality and condition, free from injurious laps, fins, seams, cracks, twists, bends, or other injurious defects. Finish shall be as produced by cold drawing, cold rolling, or machining.

- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of product materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer.

## 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

## 6. Testing Procedure

- 6.1 Tensile properties shall be determined in accordance with the applicable sections of the methods for mechanical testing of steel products in AASHTO T 244. The yield strength shall be determined by the 0.2 percent offset method.

## 7. Physical Requirements

- 7.1 Shear connector studs shall conform to the requirements for cold-finished carbon steel of AASHTO M 169, cold-drawn bar, Grades 1015 or 1020, either semi- or fully-killed. If flux-retaining caps are used, the steel for the caps shall be cold-rolled, of a low carbon grade suitable for welding, and shall conform to ASTM A 109.
- 7.2 Tensile properties as determined by tests of bar stock after drawing or of finished studs shall conform to the following minimum requirements:

Tensile Strength	60,000 psi (415 mPa)
Yield Strength	50,000 psi (345 mPa)
Elongation	20 percent in 2 inches (50 mm)
Reduction of Area	50 percent

**QUALIFICATION PROCEDURE  
FOR  
RECYCLED RUBBER ADJUSTING RINGS**

1. Scope

- 1.1 This document covers the recycled rubber adjusting ring requirements and procedure to be followed by manufacturers in order to have their product included on MDOT's Qualified Products List.

2. Submittal Procedure

- 2.1 *Product Data Sheet* - Submit a copy of product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc., to the MDOT address listed below:

Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5707

- 2.2 *Sample* - The producer shall submit a minimum 10-inch cut away sample of the proposed adjustment riser to the address listed above.
- 2.3 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.
- 2.4 *Test Reports* - The producer shall include test results from an independent testing laboratory showing results from the following tests:

<b>Physical Properties</b>	<b>ASTM Test Method</b>	<b>ASTM Title</b>	<b>Test Requirements</b>
Density	C 642	Test Method for Density, Absorption, and Voids in Hardened Concrete	1.0 g/cm <sup>3</sup> (± 0.1)
Durometer hardness, molded and interior surfaces	D 2240	Rubber Property-Durometer Hardness	75 A ± 5
Tensile strength and elongation	D 412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension	230 psi 300%

Compression deformation, initial and final	D 575	Rubber Properties in Compression	140 psi
Compression set	D 395	Rubber Properties in Compression Set	25% max
Freeze and thaw when exposed to deicing agents	C 672	Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals	no loss after 50 cycles
Coefficient of thermal expansion	C 531	Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes	$6 \times 10^{-5}$ in/in/°F
Heat Resistance (70 hours at 70°C)	D 573	Rubber-Deterioration in an Air Oven	Hardness - 10 max Tensile/elongation - 25% max
Brittleness at low temperature	D 746	Brittleness Temperature of Plastic and Elastomers by Impact	Pass @ -40°F

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples may be tested for compliance with the specified requirements. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests. If the product meets the requirements, it will be included on the QPL. The submitter will be notified in writing concerning the results of the evaluation.

### 4. Disqualification

- 4.1 A product may be immediately disqualified from MDOT use should any problem develop related to installation or performance of the product. A product may also be removed due to specification changes made by either MDOT or the product manufacturer.

### 5. Requalification

- 5.1 A product that has been disqualified will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification as stated in this procedure also apply for requalification of the product.

**QUALIFICATION PROCEDURE  
FOR  
WATERTIGHT JOINTS SYSTEMS FOR SEWERS AND CULVERTS**

1. Scope

- 1.1 This document describes the procedure to be followed by drainage product manufacturers who wish to have sewer and culvert pipe joint systems evaluated for addition to the Qualified Products List for watertight joints.

2. Submittal Procedure

- 2.1 *Request for Product Evaluation* - A written request for product evaluation must be submitted to the following address:

Construction and Technology Division  
Geotechnical Services Unit  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5677

- 2.2 *Product Information* - Include all material specifications, design drawings, field assembly diagrams and applicable Material Safety Data Sheets. All joint system components must meet applicable material requirements of the MDOT Standard Specifications for Construction.

2.2.1 A sample of the watertight joint, including a minimum of three feet of pipe on each side of the joint and the geotextile wrap (for pipe over 24 inch (600 mm) diameter), must be submitted if requested.

2.2.2 MDOT requires 14 days prior notice of the intended laboratory testing of watertight joints so the testing may be witnessed. This notification may be made in writing to the address above or by calling (517) 322-5677.

- 2.3 *Independent Laboratory Testing Results* - Results of independent laboratory tests must be submitted for evaluation. This testing must be conducted in accordance with Michigan Test Method 723. The joint system must meet the watertight requirements specified in MTM 723 in order to be considered as a qualified product.

- 2.4 *Evaluation Schedule* - A complete application, including independent laboratory test reports, must be received by the Geotechnical Services Unit on or before February 1 in order for a new product to be evaluated and placed on the Qualified Products List for use in the upcoming construction season. Subsequent modification of the QPL will be at the discretion of MDOT.

3. Evaluation

- 3.1 Pipe Diameters Up to 24 inch (600 mm).

3.1.1 The manufacturer must provide independent laboratory test reports verifying the

sewer or culvert joint system has been tested according to MTM 723 and has been found to be within the watertight limits stated in the test method. Laboratory test results are valid as long as the joint system has not been altered in any way.

- 3.1.2 Once the independent laboratory has certified the test results, the watertight joint system will be listed on the Qualified Products List by manufacturer, product name and diameter of pipe.
  - 3.1.3 The manufacturer must submit an annual certification statement documenting the joint system has not been altered from the time it was laboratory tested and placed on the QPL. If the annual certification is not received, the product will be dropped from the QPL and will not be approved for use on MDOT projects until certification is received.
  - 3.1.4 The manufacturer will be advised of the annual certification requirement with the notification that the product has been approved and placed on the QPL. After this notification it will be the manufacturer's responsibility to submit annual certification. If the joint system has been altered, the manufacturer will be required to submit independent laboratory test results in order to keep the product on the QPL.
- 3.2 Pipe Diameters Over 24 inch (600 mm).
- 3.2.1 Watertight joints for culvert or sewer pipe greater than 24 inch (600 mm) do not require pressure testing in order to be approved for use on MDOT projects, provided the manufacturer can document the performance of the identical joint configuration in a smaller diameter. The manufacturer must submit independent laboratory test reports in accordance with MTM 723 for a 24 inch (600 mm) diameter (or smaller) watertight joint which uses the same configuration.
  - 3.2.2 Watertight joints greater than 24 inch (600 mm) must use a single or double gasket configuration and must be geotextile wrapped a minimum of three feet on each side of the joint. A Type A certification must be submitted for the geotextile wrap in accordance with the Materials Source Guide.  
  
NOTE: At the manufacturer's option, these larger diameter pipes may be tested in accordance with MTM 723 and all documentation submitted as for smaller pipes.
  - 3.2.3 Approved watertight joint configurations for pipe diameters greater than 24 inch (600 mm) will be listed on the QPL subject to the same annual certification and re-evaluation requirements as for smaller diameter pipe joint systems.
  - 3.2.4 MDOT retains the right to field test the joint system or to require that the manufacturer submit additional independent laboratory test results if problems are encountered with installation or performance of the watertight sewer or culvert systems.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Product List should any problems develop related to installation or performance of the joint system or the associated pipe materials. Removal from the QPL will result in immediate loss of approved status on all active and proposed projects. If a product is removed from the QPL, it will not be approved for use on a state- or federally-funded project until the manufacturer has demonstrated, to the satisfaction of the Geotechnical Services Unit, the material or joint mechanism has been redesigned and shown to meet all applicable specifications.

## 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product.

## 6. Testing Procedure

- 6.1 MDOT does not conduct the testing on watertight sewer and culvert joint systems, but the testing procedure and physical requirements can be found in MTM 723.

**QUALIFICATION PROCEDURE  
FOR  
POLYMER COATED CORRUGATED STEEL PIPE**

1. Scope

- 1.1 This document covers the procedure to be followed by producers in order to have a polymer coated corrugated steel pipe approved for MDOT use.

2. Submittal Procedure

- 2.1 *Product Data Sheets* - Submit a copy of product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc. of the sample submitted to the MDOT address listed below:

Structural Section  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5682

- 2.2 *Report of Tests* - The producer shall include test results from an independent testing laboratory demonstrating that the polymer coated corrugated steel pipe meets the following criteria:

2.2.1 Steel pipe made from zinc-coated sheet conforming to AASHTO M 218.

2.2.2 Polymeric coating must be ethylene acrylic acid film conforming to AASHTO M 246, Grade 250/250 polymer on zinc coated steel sheet.

2.2.3 Polymeric coated pipe must pass the Coating Test Protocol as published by the National Corrugated Steel Pipe Association (NCSPA), Invert Abrasion Testing of CSP Coatings, Appendix B, March 2002. All three tiers shall be evaluated, with tier 3 being evaluated at Level I. The abrasive conditions for Level I testing are defined as follows:

2.2.3.1 Stone shall be  $\frac{3}{8}$  inch (9.5 mm) in size and the maximum loss from the Los Angeles Abrasion test (MTM 102) shall be 40 percent. Only natural aggregate shall be used.

2.2.3.2 Aggregate shall be propelled by 550 gallons per minute (2080 liters per minute) of flowing seawater down a 12 degree slope.

2.2.3.3 A total of 50,000 lbs. (110,400 kg) of aggregate shall be passed through the pipe over a ten day period in uniform increments.

2.2.3.4 To pass Level I testing, no galvanized substrate is allowed to show after testing. Certified independent test results must be submitted for review.

### 2.3 *Sample Submittal*

- 2.3.1 The producer shall provide polymer coated corrugated steel pipe and sheet for verification testing by MDOT in order to verify independent test data. Test samples shall be 3 feet (1m) long.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. The product will also be reviewed for general workmanship, corrosion protection, ease of installation, and any requirements specific to a given design. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately disqualified from MDOT use should any problem develop related to installation or performance of the product. A product may also be removed due to specification changes made by either MDOT or the product manufacturer.

### 5. Requalification

- 5.1 A product that has been disqualified will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected.

**QUALIFICATION PROCEDURE  
FOR  
CLASS B PLASTIC PIPE**

1. Scope

- 1.1 This document describes the procedure to be followed by plastic pipe manufacturers who wish to have 12 inch to 24 inch diameter sewer and culvert pipe evaluated for addition to the Qualified Products List for Class B installations for a qualification period of five years.

2. Submittal Procedure

- 2.1 *Request for Product Design Calculations Review* - A written request for product design calculations review must be submitted to the following address:

Flexible Pipe Specialist  
Municipal Utilities  
Design Division  
425 West Ottawa  
Lansing, MI 48933  
Telephone: (517) 241-0082

- 2.2 *Product Information* - Include all material specifications and design drawings including pipe geometry. Provide third party verification for the idealized wall profile geometry for each diameter of pipe. Pipe must already be listed on the QPL for Watertight Joint Systems for Sewers and Culverts in order to be considered for review under this qualification procedure.
- 2.3 *Load-and-Resistance Factor Design (LRFD) Calculations* - Include product design calculations prepared in accordance with Section 12 of the current *American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications*. Demonstrate, through the calculations, adequate strength and service for depths of cover from 10 to 16 feet. Assumed values for factors and other parameters shall be conservative and indicative of a typical embankment installation in Michigan. Provide an explanation for selection of factors and parameters if they differ from the values listed below. Submit calculations in either Microsoft Excel or Mathsoft Mathcad format.
- 2.4 *Factor and Parameter Values* - Use the following factors and parameters in the Section 12 equations. Follow the LRFD specifications and commentary for factors and parameters not listed below.

$\gamma_{EV}$	=	1.95	Load Factor for permanent load
$\gamma_{LL}$	=	1.75	Load Factor for vehicular live load
$\gamma_{WA}$	=	1.3	Load Factor for hydrostatic pressure
$\Phi$	=	1.00	Resistance Factor for flexure and minimum wall area and buckling
$\Phi_s$	=	0.90	Resistance Factor for soil stiffness
$\eta_{EV}$	=	1.0	Load Modifier applied to vertical earth loads
$P_{SP}$	=	0.120 kcf	Geostatic earth pressure
$h_w$	=	8.0 feet	Height of water surface above top of pipe

$\gamma_w$	=	0.0624 kcf	Unit weight of water
$\Delta$	=	5%	Allowable deflection of pipe
Soil type			Sn
90%			Degree of compaction - standard Proctor backfill density

(MDOT follows the suggested practice of the AASHTO LRFD Bridge Specification's commentary to design for a standard Proctor backfill density 5 percent less than specified by the contract documents.)

### 3. Evaluation

- 3.1 The submitted calculations will be reviewed for conformance with Section 12 of the current *AASHTO LRFD Bridge Design Specifications*.

### 4. Disqualification

- 4.1 A product may be immediately removed from the QPL should any problems develop related to installation or performance. A product may also be removed due to specification changes made by either MDOT or the product manufacturer. Removal from the QPL will result in immediate loss of approved status on all active and proposed projects. If a product is removed from the QPL, it will not be approved for use on a state or federally-funded project until the manufacturer has demonstrated, to the satisfaction of the Municipal Utilities Unit, the material has been redesigned and shown to meet all applicable specifications and requirements.

### 5. Requalification

- 5.1 A product that has been disqualified and removed from the QPL will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

## QUALIFICATION PROCEDURE FOR SILT FENCE GEOTEXTILE

### 1. Scope

- 1.1 This document covers the policies and procedures for the Qualified Products List for silt fence geotextile. The MDOT Construction and Technology Division will follow these procedures to determine whether to grant Qualified Product status to specific silt fence products and to maintain the list of Qualified Products. Manufacturers of silt fence geotextile must follow these procedures to be granted and to maintain Qualified Products List status for their silt fence geotextiles.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Manufacturers, or distributors/fabricators serving as a representative of the manufacturer, may submit a silt fence geotextile product for Qualified Products evaluation. The submittal shall consist of a written request for Qualified Products status and must include all of the components listed below. Only complete submittals will be reviewed by MDOT. Send complete submittals to:

Geotechnical Services Unit  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-1208

- 2.2 *Product Data Sheets* - The manufacturer shall certify each specified property value as a minimum value (mean quality control result less two standard deviations) in accordance with the ASTM Method designated for each property in Section 9.10.04 of the Standard Specifications for Construction (see Testing Requirements), and that the product meets all properties specified by MDOT. The certification shall be signed by an authorized official of the manufacturer.

- 2.2.1 Results of actual quality control testing of the lots of material represented by the sample must be submitted. All specified properties must be included in the quality control testing. This documentation shall include a description of the normal frequency and distribution of quality control sampling.

#### 2.3 *Evaluation Based on the Following Standards -*

- 2.3.1 *Sample* - Two product samples, full width by 6.5 feet (2 meter) length, taken from separate lots (production runs) shall be provided for specification conformance testing.

- 2.3.2 *Independent Sample* - The manufacturer or distributor/fabricator shall provide MDOT with the means to obtain a third, independent, random sample by a MDOT representative. This sample will be evaluated and tested for specification conformance at MDOT's option. The independent sample may be waived for manufacturers with other products already on the Qualified Products List.

- 2.4 *Evaluation Scheduling* - Manufacturers of products on the Qualified Products List which have not been routinely tested (through Approved Certifier testing) within the calendar year will be requested to submit a sample for testing to maintain Qualified Products List status. MDOT reserves the right to verify submitted test information or re-evaluate a product for specification conformance at any time.

### 3. Evaluation

- 3.1 Qualified Product submittals will be reviewed for completeness. The certification and quality control documentation will be checked for conformance to the latest published specification. The sample(s) will be tested for all properties required by the specification. Sample test results will be compared to certification and quality control documents.

### 4. Disqualification

- 4.1 Manufacturers of Qualified Products which demonstrate non-conformance to specifications will be sent written notification. A written response from the manufacturer which satisfactorily identifies the cause of non-conformance will be required. Products which are found to have subsequent specification deviations may be removed from the Qualified Products List. A product may be immediately removed as a result of problems related to the performance, durability or quality control, or any materials, manufacturing, or specification changes made by either the manufacturer or by MDOT.

### 5. Requalification

- 5.1 A product which has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request which identifies the problem(s) causing the disqualification, and provides acceptable evidence that the problem(s) have been resolved. The requirements for qualification specified in this document also apply for requalification.

### 6. Testing Procedure

- 6.1 Silt fence geotextile will be tested for the following physical properties in accordance with the ASTM designation noted.

Material Properties	Test Method	Specification Requirement
Grab Tensile Strength, lbf (N)	D 4632	100 (450) minimum
Grab Elongation, %	D 4632	40 maximum
Trapezoid Tear Strength, lbf (N)	D 4533	45 (200) minimum
Apparent Opening Size, inches (mm)	D 4751	0.02 (0.6) maximum
Permittivity (Falling Head), sec <sup>-1</sup>	D 4491	0.1 minimum

NOTE: U.V. Resistance (ASTM D 4355) will not be performed by MDOT. The manufacturer's certified test results will be acceptable.

**QUALIFICATION PROCEDURE  
FOR  
RECYCLED RUBBER/PLASTIC OFFSET BLOCKS  
FOR GUARDRAIL WITH STEEL POSTS**

1. Scope

- 1.1 This document covers the physical requirements for Recycled Rubber/Plastic Offset Blocks for use as offset blocks for Standard and Thrie Beam Guardrail on W-Beam steel posts only. It includes the procedures to be followed by manufacturers or suppliers in order to have their products included on MDOT's Qualified Products List.
- 1.2 MDOT reserves the right to randomly sample product from lots or jobsite as required to verify conformance.

2. Submittal Procedure

- 2.1 Submit a cover letter along with the required information listed in Sections 2.2 and 2.3 to the MDOT address listed below. The cover letter should state the name of the designated company contact person to whom inquiries may be made.

Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5707

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as manufacturer's name and address, model and lot number, dimensional sheets, material composition, instructions for use, and the following information:
- 2.2.1 Current and clearly legible MSDS.
- 2.2.2 Certification that the product is crash worthy to the requirements of NCHRP Report 350, and the product has FHWA approval for use on the National Highway System.
- 2.2.3 Certification that the product submitted has the same composition and physical/mechanical properties as the material used in the crash test.
- 2.3 *Evaluation Based on the Following Standards* - Submit a sample and a report of tests conducted by an independent laboratory. The physical and mechanical properties of the product must meet the requirements given in Section 7 of this procedure. Descriptions of the applicable test methods are included in Section 6 of this procedure.
- 2.4 *Evaluation Scheduling* - Completed submittals will be evaluated by MDOT throughout the year.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements, it will be included on the QPL. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be removed immediately from the QPL if any problems develop related to installation or performance.

### 5. Requalification

- 5.1 A product which has been disqualified and removed from the QPL will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the qualification period.

### 6. Testing Procedure

#### 6.1 *Plastic Blockouts*

6.1.1 ASTM D 570, Test Method for Water Absorption of Plastics.

6.1.2 ASTM D 6108, Test Method for Compressive Properties of Unreinforced and Reinforced Plastic Lumber.

6.1.3 ASTM D 6111, Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement.

6.1.4 ASTM D 6341, Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes between -30 and 140°F.

#### 6.2 *Recycled Rubber/Tire Scrap Blockouts*

6.2.1 ASTM D 575, Test Method for Rubber Properties in Compression.

6.2.2 ASTM D 395, Test Method for Rubber Properties in Compression Set.

6.2.3 ASTM C 531, Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.

6.2.4 ASTM D 573, Test Method for Rubber Deterioration in an Air Oven.

6.2.5 ASTM C 642, Test Method for Density, Absorption, and Voids in Hardened Concrete.

6.2.6 ASTM D 1148, Test Method for Rubber Deterioration - Heat and Ultraviolet Light Discoloration of Light-Colored Surfaces.

7. Physical and Material Property Requirements

- 7.1 **Certified to pass NCHRP Report 350 crash test, and be recyclable after collision.**
- 7.2 UV light resistant. Additives for UV light protection allowed to 0.1 percent.
- 7.3 Moisture absorption limited to 1.0 percent.
- 7.4 Minimum compressive strength of 450 psi.
- 7.5 Specific gravity between 0.9 and 1.2.
- 7.6 Thermal coefficient of expansion  $33 \times 10^{-6}$  /°F or less.
- 7.7 Plastics - Material composition consisting of minimum 30 percent recycled polyethylene.
- 7.8 Rubber - Material composition consisting of minimum 30 percent recycled rubber tire cord.
- 7.9 Guardrail offset blocks must conform to the dimensional tolerances listed in the current MDOT standard plan R-60 series, 'Guardrail, Types A, B, BD, T, & TD', Wood Offset Blocks for Guardrail, Type B and Type BD, Type T and Type TD, For Use on Steel Posts.
- 7.10 Provision shall be made to prevent rotation of the GOB on the post (routed, extra bolt hole, etc).
- 7.11 The height of the top of the block does not exceed the height of the rail.
- 7.12 The dimensions are in reasonable conformance with the dimensions of standard wood blocks, and are such that proper mounting height of the rail, proper alignment of post bolt holes, and proper bearing surface of the block to the rail is achieved. They must be interchangeable with standard wood blocks in a replacement situation.

**QUALIFICATION PROCEDURE  
FOR  
RECYCLED RUBBER JOINT FILLER FOR CONCRETE CONSTRUCTION**

1. Scope

- 1.1 This document covers the physical requirements for Recycled Rubber Joint Material for use as joint filler in standard concrete construction. It includes the procedures to be followed by manufacturers or suppliers in order to have their products included on MDOT's Qualified Products List (QPL).
- 1.2 MDOT reserves the right to randomly sample product from lots or jobsite as required to verify conformance.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation* - The manufacturer will submit a cover letter along with the required information listed in Sections 2.2 and 2.3 to the MDOT address listed below. The cover letter should state the name of the designated company contact person to whom inquiries may be made. Mail to:

Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as manufacturer's name and address, model and lot number, dimensional sheets, material composition, instructions for use, and the following information:
- 2.2.1 Current and clearly legible MSDS.
- 2.2.2 Certification that the product meets or exceeds all of the performance requirements from ASTM D 1751 except the minimum asphalt content of 35 percent is waived.
- 2.3 *Evaluation Based on the Following* - Submit a sample and a report of tests conducted by an independent laboratory. Descriptions of the applicable test methods are included in Section 6 of this procedure. The physical and mechanical properties of the product must meet the requirements given in Section 7 of this procedure.
- 2.4 *Evaluation Scheduling* - Completed submittals will be evaluated by MDOT throughout the year.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements, it will be included on the QPL. The submitter will be notified in writing concerning the results

of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

#### 4. Disqualification

- 4.1 A product may be removed immediately from the QPL if any problems develop related to installation or performance.

#### 5. Requalification

- 5.1 A product which has been disqualified and removed from the QPL will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the qualification period.

#### 6. Testing Procedures

- 6.1 ASTM D 545, Test Method for Preformed Expansion Joint Fillers for Concrete Construction (Nonextruding and Resilient Types)

#### 7. Physical and Material Property Requirements

- 7.1 The material must be compressed to 50 percent of its original thickness with three of its edges restrained and meet the following requirements:
- 7.1.1 The stress required to compress the product must range between 100 psi and 750 psi. If the product has a nominal thickness less than ½ inch, the acceptable compression stress changes to between 100 psi and 1250 psi.
  - 7.1.2 The extrusion of the free edge cannot exceed ¼ inch.
  - 7.1.3 The loss in weight of the compressed material cannot be more than 3 percent of the original weight.
  - 7.1.4 After compression test, the material must recover 70 percent of its original thickness in no more than 10 minutes.
- 7.2 Minimum density of 19 lb/cu ft.
- 7.3 Maximum water absorption in a 24 hour period is 15 percent volume for a product with a nominal thickness of ½ inch or more and 20 percent volume for product has a nominal thickness less than ½ inch.

## QUALIFICATION PROCEDURE FOR EPOXY RESIN ADHESIVE

### 1. Scope

- 1.1 This document covers the physical requirements for epoxy resin adhesives and the procedures to be followed by producers in order to have their products included on MDOT's Qualified Products List for a qualification period of three years.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below:

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as working time, strength properties, and recommended equipment for the epoxy submitted.

- 2.3 *Evaluation Based on the Following Standards* - Submit a completed copy of the Physical Requirements Test Results form to the MDOT Materials Technology Group for compliance with Subsection 914.06 of the Standard Specifications for Construction. This data can be from the manufacturers or an independent laboratory. Submit one quart (one liter) of each component in the proportion they are mixed to be evaluated by the Materials Technology Group.

- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any

problems develop related to installation or performance as a result of product materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer. The manufacturer will receive notification including reasons for disqualification.

## 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

## 6. Testing Procedure

- 6.1 *Number of Specimens* - The properties of tensile strength and elongation will be determined by representative values obtained from five samples. Viscosity and gel time will be measured once.
- 6.2 *Viscosity* - Viscosity shall be tested on a Brookfield Viscometer No. 2 spindle at 10 r.p.m. at standard laboratory temperature  $70 \pm 3^{\circ}\text{F}$  ( $21 \pm 2^{\circ}\text{C}$ ). The viscosity shall be 6 poise maximum.
- 6.3 *Gel Time* - The gel time shall be tested in accordance with ASTM C 881 except the sample shall be 100 grams tested at standard laboratory temperature  $70 \pm 3^{\circ}\text{F}$  ( $21 \pm 2^{\circ}\text{C}$ ). The gel time shall be between 15 and 80 minutes.
- 6.4 *Tensile Strength* - The tensile strength shall be tested in accordance with ASTM D 638 after curing for 96 hours. The tensile strength shall be 4000 psi (27.6 MPa) minimum.
- 6.5 *Elongation* - The elongation shall be tested in accordance with ASTM D 638 after curing for 96 hours. The elongation shall be 1 percent minimum.

7. Physical Requirements for Epoxy Resin Adhesive for Grouting Cracks by Pressure Intrusion

To be completed by manufacturers or independent testing laboratory:

	Result	Spec
Viscosity, poises		6 max.
Gel Time, minutes		15-80
Tensile Strength, psi (MPa)		4000 (27.6) min.
Elongation, percent		1 min.

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

*I hereby certify that the above information submitted is actual physical laboratory test data obtained according to the requirements specified in the Qualification Procedure and Testing Procedure for the product.*

Person Responsible For Testing: \_\_\_\_\_ (Signature)

\_\_\_\_\_ (Print Name)

Laboratory Name and Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date Tests Were Conducted: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

**QUALIFICATION PROCEDURE  
FOR  
BOND RELEASE AGENTS FOR EPOXY COATED DOWEL BARS**

1. Scope

- 1.1 This document covers the physical requirements for bond release agents for epoxy coated dowel bars for load transfer in concrete pavement joints and the procedure to be followed by producers in order to have their products included on MDOT's Qualified Products List for a qualification period of three years.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below.

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5695

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as manufacturer's name and address, manufacturer's trade name, model number, etc. of the bond release agent submitted. Descriptions of the test procedures are attached.
- 2.3 *Evaluation Based on the Following Standards* - Submit a completed copy of the Physical Requirements for Bond Release Agents (Section 7 form) to the MDOT Materials Technology Group for compliance with Subsection 914.07 of the Standard Specifications for Construction. Testing must be conducted by an independent testing agency. Submit two epoxy coated dowel bar specimens with bond release agent applied to the MDOT laboratory.
- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and products submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be made at the discretion of MDOT.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformance to the specified requirements. If the product meets the requirements, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of product materials, manufacturing or plan dimension changes made by either MDOT or the product manufacturer.

#### 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the qualification period.

#### 6. Testing Procedure

- 6.1 *Number of Specimens* - The number of specimens required for independent testing shall be as described in the Michigan Test Method for Bond Release Agents for Epoxy Coated Dowel Bars (MTM 614).
- 6.2 *Material and Apparatus Requirements* - Material and apparatus requirements for independent testing of the release agent on coated dowel bars shall be as described in MTM 614. The steel dowel bars used in testing shall be straight, smooth, 1.25-inch (32.5 mm) diameter, and 18 inches (468 mm) in length meeting the requirements of Subsection 914.07 of the Standard Specifications for Construction. The coating shall be an approved epoxy meeting the requirements of Subsection 905.03 of the Standard Specification for Construction.
- 6.3 *Test Procedure Requirements* - The required test procedures for independent testing shall be as described in MTM 614.
- 6.4 *Specification Requirements* - The specification requirements for independent testing described in MTM 614 shall be as specified in Subsection 914.07 of the Standard Specifications for Construction.
- 6.5 *Report* - The report of independent testing shall include the information outlined in Section 4 of MTM 614. This information must be reported on the Physical Requirements for Bond Release Agents sheet included in this Qualification Procedure packet.

7. Physical Requirements for Bond Release Agents

To be completed by independent testing agency:

Product use: **Bond Release Agent**

Producer: \_\_\_\_\_

Product Name: \_\_\_\_\_

Pull-out Resistance Test:

Maximum Shear Bond Stress Achieved \_\_\_\_\_ 60 psi (414 kPa)

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

*I hereby certify that the above information submitted is actual physical laboratory test data obtained according to the requirements specified in the Qualification Procedure and Testing Procedure for the product.*

Person Responsible For Testing: \_\_\_\_\_(Signature)

\_\_\_\_\_ (Print Name)

Laboratory Name and Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date Tests Were Conducted: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

**QUALIFICATION PROCEDURE  
FOR  
PREFORMED WATERPROOFING MEMBRANES FOR VERTICAL AND  
HORIZONTAL APPLICATIONS**

1. Scope

- 1.1 This document covers the physical requirements for preformed waterproofing membranes. Producers must follow this procedure in order to have their products included on MDOT's Qualified Products List.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation* - Submit completed copies of MDOT Form 1022 (Qualified Products Evaluation) and the attached Table 1, as required by this procedure, to the MDOT address listed below:

Materials Technology Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-6110

- 2.2 *Product Data Sheets* - Include product literature describing the product's typical application, limitations, and other pertinent information such as surface preparation, repairing, priming, use of adhesives on green concrete, and coverage rates.
- 2.3 *Evaluation Based on the Following Standards* - Submit a report of tests conducted by an independent laboratory. The physical properties of the product must meet the requirements given in Table 1 of this procedure. Descriptions of the test methods are included in this procedure. Submit a 3 ft. x 3 ft. sample of the preformed membrane.
- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT no later than January 15 to be included in that year's evaluation. Addition of new products to the Qualified Products List will be made only once a year upon completion of evaluations for all material submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested (if required) for conformation to the specified requirements. If the product meets the requirements, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting additional testing on independently obtained samples.
- 3.2 MDOT must be notified in writing of any change in the product.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of product material, manufacturing, or plan dimension changes made by either MDOT or the product's manufacturer.

#### 5. Requalification

- 5.1 A product that had been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the accepted evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification.

#### 6. Testing Procedure

- 6.1 *Independent Testing Laboratory* - The following testing must be conducted by an independent testing laboratory.
- 6.2 *Thickness* - The thickness of the material shall be run according to ASTM D 1777.
- 6.3 *Tensile Strength* - The tensile strength shall be determined as described in ASTM D 882. The specimen size shall be 1 x 6 inch. Cross head speed shall be 2 inches/minute with a 4-inch initial jaw separation. Record breaking load in force per unit of width (lb/in).
- 6.4 *Elongation* - The maximum elongation of the membrane will also be recorded during Tensile Strength (ASTM D 882) testing, as a percent of original jaw separation.
- 6.5 *Puncture* - Puncture resistance shall be measured according to ASTM E 154. Lower the test machine at a rate of 0.2 inches per minute. Continue the test until maximum load is reached. Record results as a maximum load in pound-force (lbf).
- 6.6 *Permeance* - Permeance shall be measured according to ASTM E 96 (water method). The results will be measured in perms (1 perm = 57 ng/Pa·s·m<sup>2</sup>).
- NOTE: "ng" refers to nanograms (1 x 10<sup>-9</sup> grams)
- 6.7 *Pliability* - Material shall be conditioned to -20°F for 2 hours. Bend through 180 degrees at a uniform speed in approximately 2 seconds over a 1 inch mandrel. Examine specimens for cracks. Any cracks in the specimen will constitute a failure.
- 6.8 *Reinforcement* - All membranes must contain a heat resistant woven or non-woven backing.
- 6.9 *Peel Adhesion* - Peel Adhesion shall be measured according to ASTM D 903. Record the force in pounds per inch. Membranes must be "peel and stick".

#### 7. Physical Requirements

To be conducted and completed by an independent testing laboratory.

**Table 1: Test Results**

Test Method	Test Result	Spec
Thickness, inches ASTM D 1777		0.065 min.
Tensile Strength, pounds/inch ASTM D 882		50 min.
Elongation, % ASTM D 882		30 min.
Puncture, lbf ASTM E 154		200 min.
Water Vapor Transmission, Perm ASTM E 96 (water method)		0.1 max.
Pliability ASTM D 146		No Cracks
Fabric Reinforcement		Yes
Peel Adhesion, pounds/inch ASTM D 903		6 min.

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Material: **PASSES** or **FAILS** (circle one)

*I hereby certify that the above information submitted is actual physical laboratory test data obtained according to the requirements specified in this Qualification Procedure.*

Person Responsible For Testing: \_\_\_\_\_ (Signature)  
 \_\_\_\_\_ (Print Name)

Laboratory Name and Address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Date Tests Were Conducted: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

## QUALIFICATION PROCEDURE FOR BRIDGE COATING SYSTEMS

### 1. Scope

- 1.1 This document covers the requirements for bridge coating systems and the procedures for coating manufacturers to have their products included on MDOT's Qualified Products List. The qualification period is for five years from the date of acceptance.

### 2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the address listed below.

Structural Section - Coatings Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5722

- 2.2 *Product Data Sheets* - Only products with volatile organic content equal to or less than 3.3 lb/gal (400 g/L) will be accepted. Do not submit systems that we have already tested more than once.

2.2.1 All products must be from the standard product line of the submitting company, e.g. special products just for Michigan are not allowed.

2.2.2 All testing is to be done through the National Transportation Product Evaluation Program (NTPEP) following the guidelines as per AASHTO R 31.

2.2.3 All products must be non detect by EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP) for lead and chromium with documentation from an independent laboratory.

2.2.4 The coats will have a maximum "dry to top coat" time of 24 hours at 50°F and at 4 mil dry film thickness above the minimum for each coat.

2.2.5 Organic zinc primers must meet the definition for an organic zinc-rich primer as per SSPC-Paint 20, Type II. The primer is to be tinted to contrast with steel blast cleaned to a SSPC-SP10 near white blast. The intermediate coat shall be white and the top coat shall be green (14062 or 24062 Federal Standard 595b Paint Color).

2.2.6 Submit certification stating that the primer meets the requirements for Slip-Co-Efficient and Creep Resistance for ASTM A 490 Class "B". The testing performed for the certification must have been completed no more than ten years prior to the application of the primer by the contractor.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. If the product meets the requirements it will be included on the Qualified Products List. The submitter will be notified in writing concerning the favorable results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to products, materials, or manufacturing. The manufacturer will receive notification including reasons for disqualification.

#### 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected.

**QUALIFICATION PROCEDURE  
FOR  
GRASS SEED AND SEED MIXTURES (VARIETIES)**

1. Scope

- 1.1 This document covers the requirements for grass seed varieties to be accepted on the Qualified Products List.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below:

Pavement and Roadside  
Maintenance Division  
6333 Lansing Road  
Lansing, MI 48917  
Telephone: (517) 322-3312

- 2.2 *Product Information* - Include product information as listed below:

2.2.1 *Product Data Sheets* - Enclose product literature for grass seed varieties describing the use, restrictions, cost, and anticipated benefit to MDOT's transportation system.

2.2.2 *Test Reports* - Include test, research and evaluation reports conducted by an independent entity. Product literature is not sufficient. Copies of actual test reports are required. MDOT may perform in-house testing for informational purposes.

2.2.3 *Supporting Evaluation* - Enclose a list of other state DOT's or agencies (contact person, telephone number) who have approved your material or product for use.

- 2.3 *Evaluation Based on the Following Standards* - The product will be evaluated in two ways:

2.3.1 If a company has a new grass seed variety that is nearly identical to materials on the list, it has been included with the condition that its field performance be equal to or better than other materials.

2.3.2 If a company has a new grass seed variety that is different, yet is presented as doing the same job of other prequalified grass seed varieties, the company's representative will allow the material to be field tested at no cost to MDOT on an MDOT construction project so that its performance and installation can be observed under "real construction field conditions".

- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT after September 15 and no later than January 15 to be included in that year's evaluation and field performance testing. Addition of new products to the Qualified Products List will be

made only once a year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. The submitter will be notified in writing concerning the way the product will be evaluated (Section 2.3.1 or 2.3.2) prior to proceeding with the field testing. Once the product meets all the requirements of this procedure it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to performance. The manufacturer will receive notification including reasons for disqualification.

### 5. Requalification

- 5.1 A product which has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

### 6. Testing Procedure

- 6.1 This product is tested based upon its effectiveness and efficiency in its field performance. The area to be field tested shall be 600 square yards (500 sq m) maximum.

**QUALIFICATION PROCEDURE  
FOR  
MULCH BLANKETS**

1. Scope

- 1.1 This document covers the requirements for straw and/or excelsior mulch blankets to be placed on the Qualified Products List. The qualified product list for mulch blankets includes high velocity mulch blankets (917.15.B1) and mulch blankets (917.15.B2) as described in the Standard Specifications for Construction.

2. Submittal Procedure

- 2.1 *Qualified Products Evaluation Form* - Submit a completed copy of the evaluation form (included in the Qualification Procedure packet) to the MDOT address listed below. This packet can be obtained from any of the MDOT contacts listed in Section 2.4 of this procedure.

Pavement and Roadside  
Maintenance Division  
6333 Lansing Road  
Lansing, MI 48917  
Telephone: (517) 322-3312

- 2.2 *Product Information* - Include product information as listed below:

2.2.1 *Product Data Sheets* - Enclose product literature for mulch blankets describing the use, restrictions, cost and anticipated benefit to MDOT's transportation system.

2.2.2 *Test Reports* - Include test reports conducted by an independent testing laboratory indicating that the material meets all applicable national standards or specifications, such as ASTM or AASHTO. Product literature is not sufficient. Copies of actual test reports are required. MDOT may perform in-house testing for informational purposes.

2.2.3 *Supporting Evaluation* - Enclose a list of other state DOT's or agencies (contact person, telephone number) who have approved your material or product for use.

2.2.4 *Sample Specification* - Enclose a sample specification for product usage (not proprietary).

- 2.3 *Evaluation Based on the Following Standards* - The product will be evaluated in two ways:

2.3.1 If a company has a new material that is nearly identical to materials on the list, it has been included with the condition that its field performance be equal to or better than other materials.

2.3.2 If a company has a new material that is different, yet is presented as doing the same job of other prequalified materials, the company's representative will allow

the material to be field tested at no cost to MDOT on an MDOT construction project so that its performance and installation can be observed under “real construction field conditions”.

- 2.4 *Evaluation Scheduling* - Completed Qualification Procedure packets, including evaluation forms and product submittal, must be received by MDOT after September 15 and no later than January 15 to be included in that year’s evaluation and field performance testing. Addition of new products to the Qualified Products List will be made only once per year upon completion of evaluations for all materials submitted by the January 15 deadline. Subsequent modifications (for purposes other than the addition of new products) will be at the discretion of MDOT.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. The submitter will be notified in writing concerning the way the product will be evaluated (Section 2.3.1 or 2.3.2) prior to proceeding with the field testing. Once the product meets all the requirements of this procedure, it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of products materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer. The manufacturer will receive notification including reasons for disqualification.

### 5. Requalification

- 5.1 A product which has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

### 6. Testing Procedure

- 6.1 This product is tested based upon its effectiveness and efficiency in its field performance. The area to be field tested shall be 600 square yards (500 sq m) maximum.

**QUALIFICATION PROCEDURE  
FOR  
MULCH BINDERS (TACKIFIERS)**

1. Scope

- 1.1 This document covers the requirements for mulch binder (tackifiers) to be accepted on the Qualified Products List.
- 1.2 This qualification procedure will be used for the following types of mulch binders (tackifiers):
- latex base
  - wood fiber
  - recycled newsprint
  - quar gum
- 1.3 Other types of mulch binders (tackifiers) will be evaluated following this procedure when requested.

2. Submittal Procedure

- 2.1 *New Materials Products Evaluation Form 1022* - Submit a completed copy of Form 1022 (included in the Qualification Procedure packet) to the MDOT address listed below:
- Pavement and Roadside  
Maintenance Division  
6333 Lansing Road  
Lansing, MI 48917  
Telephone: (517) 322-3312
- 2.2 *Product Data Sheets* - Include product literature describing the use of mulch binder (tackifiers) and any other pertinent information.
- 2.3 *Evaluation Based on the Following Standards* - The product will be evaluated in two ways:
- 2.3.1 If a company has a new material that is nearly identical to materials on the list, it has been included provisionally with the condition that during the first year its field performance be equal to or better than other materials.
- 2.3.2 If a company has a new material that is different, yet is presented as doing the same job of other prequalified materials, the company's representative will allow the material to be field tested at no cost to MDOT on an MDOT Construction Project so that its performance and installation can be observed under "real construction field conditions".
- 2.4 *Evaluation Scheduling* - There is no time schedule for re-evaluating products. However, any time the field performance is questionable, re-evaluation is considered necessary.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. If the product meets the requirements it will be included on the Qualified Products List. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of products materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer. The manufacturer will receive notification including reasons for disqualification.

#### 5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

#### 6. Testing Procedure

- 6.1 This product is qualified for use based upon its effectiveness and efficiency in its field performance.

**QUALIFICATION PROCEDURE  
FOR  
LIGHT WEIGHT COMPOSITE HANDHOLE**

1. Scope

- 1.1 This document covers the procedure manufacturers must follow to have a light weight composite handhold approved for use on MDOT projects.

2. Submittal Procedure

- 2.1 *Product Data Sheets* - Submit a copy of product literature describing the product's use and other pertinent information such as design drawings, manufacturer's name and address, manufacturer's trade name, model number, etc., to the MDOT address listed below:

Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-5707

- 2.2 *Report of Tests* - Provide independent laboratory test report(s) stating that the structural capacity of the pull box and cover is rated as follows:

- 2.2.1 Handhole covers shall have a minimum static coefficient of friction of 0.5.
- 2.2.2 Handhole covers shall withstand a vertical test load of 20,800 lb distributed over a 10 x 10 inch area.
- 2.2.3 Handhole boxes shall withstand a vertical test load of 20,800 lb distributed over a 5 x 10 inch area.
- 2.2.4 Handhole boxes shall withstand a lateral sidewall test load of 1,200 psf distributed over an area 24 inches wide by the depth of the box.

Structural capacity shall be tested in accordance with the *Western Underground Committee, Guide 3.6, Non-Concrete Enclosures*.

- 2.3 *Sample Submittal* - MDOT reserves the right to request a sample if further analysis is required.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples may be requested to test for compliance with the specified requirements. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

4. Disqualification

- 4.1 A product may be immediately disqualified from MDOT use should any problem develop related to installation or performance of the product. A product may also be removed due to specification changes made by either MDOT or the product manufacturer.

5. Requalification

- 5.1 A product that has been disqualified will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected.

**QUALIFICATION PROCEDURE  
FOR  
FRANGIBLE LIGHT STANDARD TRANSFORMER BASE ASSEMBLY**

1. Scope

- 1.1 This document covers the qualification procedures for Frangible Light Standard Transformer Base Assembly for placing luminaries in the roadway clear zone. It includes the procedures to be followed by manufacturers or suppliers in order to have their products included on MDOT's Qualified Products List (QPL).
- 1.2 MDOT reserves the right to randomly sample product from lots or jobsite as required to verify conformance.

2. Submittal Procedure

- 2.1 Submit a cover letter and a frangible light standard transformer base along with the required information listed in Section 2.2 for each product to the MDOT address listed below. The cover letter should state the name of the designated company contact person to whom inquiries may be made. Mail to:

Structures Unit, Experimental Studies Group  
Construction and Technology Division  
8885 Ricks Road  
P.O. Box 30049  
Lansing, Michigan 48909  
Telephone: (517) 322-5707

- 2.2 *Product Data Sheets* - Include product literature describing the product's use and other pertinent information such as manufacturer's name and address, model and lot number, dimensional sheets, hardware, material composition, and the following information:
- 2.2.1 Certification that the product is crash worthy to the requirements of NCHRP Report 350 Test Level 3, and meets the additional requirements of the American Association of State Highway and Transportation Officials (AASHTO) "*Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*" Section 12, Breakaway Supports.
- 2.2.2 Submit a copy of the FHWA approval letter for the product use on the National Highway System. Provide certification that the product submitted has the same chemistry, mechanical properties, and geometry as the FHWA approved product.
- 2.2.3 Submit a copy of the test report by an independent facility of the dynamic performance (crash) test outlined in the standards in 2.2.1 above.
- 2.2.4 Provide clear instructions for installation, including base bolt size, anchor bolt size, washer configuration and material, distance base tabs project beyond the nut for the specified bolt circle, and nut tightening procedures. Lock washers must be included with the base bolts and anchor bolts.

- 2.2.5 Provide information on the design strength of the frangible light standard transformer base, including maximum pole mounting height and weight, and ability to carry the loads as specified in AASHTO "*Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*" Section 3, Loads.

### 3. Evaluation

- 3.1 **Certified to meet NCHRP Report 350 and AASHTO dynamic performance criteria.**
- 3.2 Frangible light standard transformer bases must conform to the dimensional tolerances given in the FHWA approved drawing submitted in Section 2.2. The base tabs must project a minimum of  $\frac{1}{2}$  the anchor bolt diameter beyond the nut for the specified bolt circle. Base tabs must be able to withstand snug tightening with a lock washer and a 1:20 beveled washer in place without damage.
- 3.3 Completed submittals will be evaluated by MDOT throughout the year. The submitted information will be reviewed for conformance to the specified requirements. If the product meets the requirements, it will be included on the QPL. The submitter will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

### 4. Disqualification

- 4.1 A product may be removed immediately from the QPL if any problems develop related to installation or performance. The submitter will be notified in writing of the effective date of product removal.

### 5. Requalification

- 5.1 A product which has been disqualified and removed from the QPL will be considered for re-evaluation only after submittal of a written request along with acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the qualification period.

## QUALIFICATION PROCEDURE FOR RETROREFLECTIVE SHEETING/PERMANENT SIGNING

### 1. Scope

- 1.1 This document covers requirements for retroreflective sheeting used in permanent signing and the procedure manufacturers must follow to have their products included on the MDOT Qualified Products List.

### 2. Evaluation Procedure

- 2.1 The Michigan Department of Transportation specification requirements for permanent signing are shown in the “Retroreflective Sign Sheeting Material Guidelines” table in this procedure.
- 2.2 MDOT requires that all materials be tested by the National Transportation Product Evaluation Program (NTPEP) and meet the criteria listed below prior to any consideration being given regarding sign fabrication and field testing. NTPEP testing is a requirement for all new suppliers or for suppliers attempting to requalify a product that was removed from the Qualified Products List. There will be no exceptions. All sheeting and ink colors used for permanent signing must be tested (typically white, yellow, red, green, blue, and brown). The NTPEP test deck samples from Minnesota will be the basis for the outdoor weathering review.
  - 2.2.1 All sheeting samples must pass ASTM D 4956 and federal specification L-S-300C physical test requirements with a rating of “no effect.”
  - 2.2.2 After two years of weathering at 45 degrees, all sheeting samples must pass the visual panel comparison of the shrinkage, cracking, and blistering with a rating of “none evident” and must pass the color fastness test with a rating not less than “good.”
  - 2.2.3 After two years of weathering at 45 degrees, all sheeting samples will be reviewed for loss of reflectivity and color change by comparing data with the initial coefficient of reflection and initial chromaticity color coordinates. Pass/fail determinations will be made on an individual basis, although samples must retain a minimum 90 percent reflectivity based on a control sample. Samples with chromaticity color coordinate changes will be determined a failure if the color fastness test is a rating less than “good.”

### 3. Fabrication Requirements

The manufacturer must comply with steps 3.1, 3.2, and 3.3 listed below prior to sample submittal.

- 3.1 Manufacturers must provide documentation from an independent agency that shows successful fabrication and field performance of their sheeting.
- 3.2 Manufacturers must provide documentation that details performance life of sheeting (minimum of 80 percent reflectivity maintained at ten years).

- 3.3 All fabrication testing will be done by MDOT Operations Division Central Sign Shop. The manufacturer shall provide MDOT with the sheeting, ink, and any necessary substrates. The inks shall not require clear coating. All sheeting and ink shall be manufactured by the company providing the materials for testing. All materials will remain the property of MDOT.
- 3.4 The manufacturer will supply MDOT with the following size sheeting samples: 1 -12.75 in. x 50 yd. roll and 1 - 36 in. x 25 yd. roll of green sheeting; 1 - 48 in. x 25 yd. roll of yellow sheeting; 1 - 24 in. x 50 yd. roll of white sheeting; 1 - 24 in. x 50 yd. roll of black vinyl; 1 - 24 in. x 25 yd. roll of blue translucent film; 1 - 2 in. x 50 yd. roll of white sheeting; 1 - 48 in. x 50 yd. roll of slip sheeting; 1 gallon of black ink and 1 gallon of blue ink.
- 3.5 Testing will be done on standard MDOT signing substrates: 0.080 aluminum, aluminum extrusion, and plywood.
- 3.6 The MDOT Operations Division Central Sign Shop will report any significant fabrication problems to the Traffic Signing Unit, Operations Division and a determination will be made whether to proceed with the field test.

#### 4. Field Test Requirements

Field tests are necessary for initial placement on the Qualified Products List and for reinstatement of a product that has been removed from the QPL. Field Test Parameters are:

- 4.1 The MDOT shall choose the location of the test site.
- 4.2 The signs shall be fabricated by MDOT personnel in the presence of the manufacturer and shall be identified as experimental with a tag on the back of the sign. Sign substrates will consist of .080 aluminum, aluminum extrusion, and plywood.
- 4.3 Signs will be reviewed by MDOT personnel. All reviews shall be documented with date, sign number, condition of sign, and any other pertinent data. Problems that will result in rejection of the product include, but are not limited to: wrinkling, topcoat splitting, peeling, loss of reflectivity, and color change.
- 4.4 The manufacturer will be notified in writing concerning the results of the field study. From the time of sign installation, two years may be taken by MDOT to conclude the field evaluation. Completion of a successful field test indicates that the product will be approved for one year. At the end of the one-year period, continued approval will be based on successful fabrication and field performance in Michigan.

#### 5. Evaluation Scheduling

- 5.1 The MDOT reserves the right to verify submitted test information or to modify acceptance criteria for retroreflective sheeting at any time.

#### 6. Submittal Procedure

- 6.1 Upon the approval of new retroreflective sheeting, the following information is needed in

order to add the product to the QPL. This information is to be supplied along with the Traffic Signing Unit Supervisor's approval letter of the new retroreflective sheeting.

- Company name
- Company address
- Company point of contact
- Phone number for contact
- MDOT name of material
- MDOT Specification Number
- Manufacturer specific product name
- Any applicable notes the Traffic Signing Unit Supervisor would like added to the list

<b>Retroreflective Sign Sheeting Material Guidelines</b>	
Sign Category	Material Type
Yellow Warning Signs [W series (non school related), E13-1, E13-2, E11-1, OM-1, OM-2, OM-3]	ASTM Type IX Fluorescent Yellow
School Signs (S1-1, S4-3, S4-5, S4-5a, school portion of S5-1, W16-7p, W16-9p, W16-2, W16-2a)	ASTM Type IX Fluorescent Yellow Green
Freeway Guide Signs White legends; borders; arrows; and white portion of route markers, shields, and auxiliaries  Background	ASTM Type IX White  ASTM Type IV Green, Brown, or Blue
Non Freeway Guide Signs	ASTM Type IV
Regulatory Signs	ASTM Type IV

**QUALIFICATION PROCEDURE  
FOR  
FLEXIBLE PLASTIC DELINEATOR POSTS, GROUND MOUNT**

1. Scope

- 1.1 This document covers the requirements for flexible delineator posts and the procedure to be followed by manufacturers in order to have their products included on MDOT's Qualified Product List.

2. Submittal Procedure

- 2.1 *Sampling* - Flexible delineator post samples are submitted directly to the National Testing Product Evaluation Program (NTPEP) for evaluation in their testing program. Posts must undergo summer and winter impact testing.

- 2.2 *Report of Tests* - The manufacturer must submit the following information when requesting product approval.

2.2.1 A letter indicating NTPEP testing has been completed within the past three years and includes the dates of test. A copy of NTPEP test results does not have to be submitted unless specifically requested by the MDOT.

2.2.2 Manufacturer name and address, product literature, model number, installation instructions, and any other pertinent information.

- 2.3 *Evaluation Based on the Following Standards* - The MDOT initially approves flexible delineator posts based on NTPEP test results. Once the product is evaluated and approved, it is placed on the Qualified Products List for at least two years. Continued use of the product is dependent upon satisfactory laboratory and/or field performance.

- 2.4 *MDOT Contacts* - The following personnel may be contacted if questions arise regarding submittal and/or evaluation of this product:

Division of Operations  
Traffic Operations Section  
425 West Ottawa Street  
P.O. Box 30050  
Lansing, MI 48909  
Telephone: (517) 335-2624

- 2.5 *Evaluation Scheduling* - New product submittals will be evaluated by MDOT throughout the year.

3. Evaluation

- 3.1 The MDOT reviews NTPEP data for conformance to the specified requirements. The survival rate after winter and summer impact testing is the primary factor in selecting products. If the product meets the requirements, it will be included on the Qualified Products List. The manufacturer will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of products materials, manufacturing, or plan dimension changes made by either MDOT or the product manufacturer. The manufacturer will receive notification including reasons for disqualification.

5. Requalification

- 5.1 A product that has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected.

## QUALIFICATION PROCEDURE FOR COLD PLASTIC TAPE

### 1. Scope

- 1.1 This document covers the physical requirements for preformed pavement marking materials to be followed by producers in order to have their product included on MDOT's Qualified Products List.
- 1.2 This procedure covers:
- Longitudinal Lines
  - Legends, Symbols and Arrows
  - Crosswalk and Top Bars

### 2. Submittal Procedure

- 2.1 *MDOT Contacts* - The following personnel may be contacted if questions arise regarding submittal and/or evaluation of this product:

Division of Operations  
Traffic Operations Section  
425 West Ottawa Street  
P.O. Box 30050  
Lansing, MI 48909  
Telephone: (517) 373-3340

- 2.2 *Product Data Sheets* - Include product literature describing the use of pavement marking materials, and other pertinent information as required by Penn DOT.
- 2.3 *Evaluation Based on the Following Standards* - MDOT initially approves pavement marking materials based on laboratory and field testing provided by the Penn DOT from the NASHTO Regional Test Deck. Once the product is evaluated and approved, it is placed on the Qualified Products List for at least two years. Continued use of the product is dependant upon satisfactory laboratory test verification and field performance.
- 2.4 *Evaluation Scheduling* - Penn DOT receives samples for field and laboratory testing of pavement marking materials on the even numbered years.

### 3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be tested for conformance to the specified requirements. If the product meets the requirements it will be included on the Qualified Products List. The submitter of products placed on the Qualified Products List will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own tests.

#### 4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of products, materials, or manufacturing changes made by either MDOT or the product manufacturer. The manufacturer will receive notification including reasons for disqualification.
- 4.2 The formulation of the product is continually verified by testing random samples taken from the filling line at the manufacturer's plant. The first ten batches produced at the start of the season are tested for conformance with specification requirements. If all requirements are met on these samples, then random samples are taken through the year to ensure continued conformance with specifications. The manufacturer is notified of any out-of-specification results and continued failures are grounds for removal from the Qualified Products List. Products may also be removed from the approved list due to continued application or field performance problems.

#### 5. Requalification

- 5.1 A product which has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. The requirements for qualification, as specified in this document, also apply for requalification of the product at the expiration of the qualification period.

**QUALIFICATION PROCEDURE  
FOR  
TEMPORARY PAVEMENT MARKING MATERIALS**

1. Scope

- 1.1 This document covers the physical requirements for temporary pavement marking materials to be followed by producers in order to have their product included on MDOT's Qualified Products List.

2. Submittal Procedure

- 2.1 *MDOT Contacts* - The following personnel may be contacted if questions arise regarding submittal and/or evaluation of this product:

Division of Operations  
System Operation & Management Section  
8885 Ricks Road  
P.O. Box 30049  
Lansing, MI 48909  
Telephone: (517) 322-6794

- 2.2 *Product Data Sheets* - Include product literature describing the use of pavement marking materials, and other pertinent information as required by Penn DOT.

- 2.3 *Evaluation Based on the Following Standards* - MDOT initially approves pavement marking materials based on laboratory and field testing provided by the Penn DOT from the NASHTO Regional Test Deck. Once the product is evaluated by Penn DOT, it may be placed on several pilot projects chosen by MDOT. The pilot materials will then be evaluated based on specific performance factors determined by the department. The evaluation period will be a minimum of one construction season. Once the product is evaluated and approved, the product may be placed on the Qualified Products List. Continued use of the product is dependant upon satisfactory field performance.

- 2.4 *Evaluation Scheduling* - Penn DOT receives samples for field and laboratory testing of pavement marking materials on the even numbered years.

3. Evaluation

- 3.1 The submitted information will be reviewed and samples will be evaluated for conformance to the specified requirements. If the product meets the requirements it will be included on the Qualified Products List. The submitter of products placed on the Qualified Products List will be notified in writing concerning the results of the evaluation. MDOT reserves the right to verify submitted test information or re-evaluate a product at any time by conducting its own evaluation.

4. Disqualification

- 4.1 A product may be immediately removed from the Qualified Products List should any problems develop related to installation or performance as a result of products, materials, or manufacturing changes made by either MDOT or the product

manufacturer. The manufacturer will receive notification including reasons for disqualification.

- 4.2 The manufacturer is notified of any out-of-specification results and continued failures are grounds for removal from the Qualified Products List. Products may also be removed from the approved list due to continued application or field performance problems.

## 5. Requalification

- 5.1 A product which has been disqualified and removed from the Qualified Products List will be considered for re-evaluation only after submittal of a written request along with the acceptable evidence that the problems causing the disqualification have been corrected. MDOT may require the product be re-evaluated on a pilot project.