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# DMS-4200

## Pavement Markers (Reflectorized)

Effective Date: **January 2021**



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### 1. DESCRIPTION

This Specification governs the materials, composition, sampling, testing, pre-qualification, field evaluation, and Quality Monitoring Program (QMP) for reflectorized pavement markers (RPMs).

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### 2. UNITS OF MEASUREMENTS

The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

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### 3. MATERIAL PRODUCER LIST

The **Materials and Tests** Division (**MTD**) maintains the Material Producer List (MPL) of all materials conforming to the requirements of this Specification. Materials appearing on the MPL, entitled "[Pavement Markers and Traffic Buttons](#)," require no further sampling and testing before use, unless deemed necessary by the Project Engineer or **MTD**.

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### 4. BIDDERS' AND SUPPLIERS' REQUIREMENTS

The Department will only purchase or allow on projects those products listed by producer and product code or designation shown on the MPL.

Use of pre-qualified product does not relieve the Contractor of the responsibility to provide product that meets this Specification. The Department may inspect or test material at any time and reject any material that does not meet the specifications.

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### 5. PRE-QUALIFICATION PROCEDURE

The pre-qualification procedure consists of the steps listed below, which are described in more detail in the following sections:

- pre-qualification request,
- laboratory testing,
- field testing,
- provisional qualification,
- project evaluations, and
- full qualification.

**MTD** will notify the producer at the completion of each step and will require confirmation from the producer's contact person before proceeding to the next step.

The Department normally bears the costs of sampling and testing; however, the producer will bear the costs associated with materials failing to conform to the requirements of this Specification. The Director of **MTD** will assess this cost at the time of testing and bill amounts due directly to the producer.

5.1. **Pre-Qualification Request.** Submit a request for evaluation under DMS-4200 to [DMS\\_Prequal@txdot.gov](mailto:DMS_Prequal@txdot.gov).

Include the following information with the request:

- name and contact information, including an email address for the person who will be the primary contact during the qualification process;
- laboratory test results—from the producer’s lab or an independent test laboratory—showing actual test results that meet the requirements of ASTM D4280;
- product data sheets;
- list of locations and application dates where the product is being evaluated or is in current use; and
- laboratory test results and 12-mo. field test results from the National Transportation Product Evaluation Program (NTPEP). Submit the final 2-yr. NTPEP field test results when available.

5.2. **Laboratory Testing.** NTPEP laboratory test results must meet all the requirements of ASTM D4280 for the laboratory tests performed.

Submit 50 RPMs of each color and type at no cost to the Department for laboratory testing. MTD will acknowledge receipt of materials and specify a tentative completion date for laboratory testing. MTD will test RPMs in accordance with Article 4200.7 and will send notification of results once laboratory testing is complete.

If Department or NTPEP laboratory testing shows RPMs do not meet the requirements of this Specification, evaluation will cease, and RPMs will not be qualified. Producers may resubmit materials for qualification after providing documentation identifying the cause and corrective action taken.

5.3. **Field Testing.** Submit NTPEP 12-mo. field test data (and final field test data when available) to MTD for review. MTD will acknowledge receipt of NTPEP data and will provide results of review within 1 mo. of receipt.

MTD will test RPMs on a seal coat pavement in accordance with [Tex-878-B](#).

The 12-mo. NTPEP and 12–14 mo. Department field test results for the initial provisional pre-qualification and the final 2-yr. NTPEP test results for final qualification must meet the following, as defined by the NTPEP Project Work Plan for Field Evaluations of Raised Pavement Markers and Marker Adhesives:

- retention rate equal or greater than 90% of the placed RPMs (excluding the RPMs removed for testing) after 12 mo. (NTPEP), 12–14 mo. (Department), and 80% after final evaluation;
- visual evaluation of three or greater, for the marker case and marker lens, for a minimum of 90% of the placed RPMs (excluding the RPMs removed for testing) after 12 mo. (NTPEP), 12–14 mo. (Department), and 80% after final evaluation; and
- minimum Coefficient of Luminous Intensity ( $R_1$ ) values listed in Table 1 after 12 mo. (NTPEP), 12–14 mo. (Department) on the roadway, and 90% of the listed values after final evaluation.

**Table 1**  
**Minimum Coefficient of Luminous Intensity ( $R_1$ ) at 0.2° Observation Angle and**  
**0° Entrance Angle (mcd/lx)**

Face	$R_1$ (mcd/lx)
Crystal	93.0
Amber	65
Red	19

If Department or NTPEP field test results indicate RPMs do not meet the requirements of this Specification, evaluation will cease, and RPMs will not be qualified. Suppliers may resubmit materials for qualification after providing documentation identifying the cause and corrective action taken.

5.4. **Evaluation.**

- 5.4.1. **Provisional Qualification.** MTD will grant provisional qualification after successful completion of the laboratory testing, seal coat pavement field evaluation, and 12-mo. NTPEP field test. MTD will send notification of provisional qualification, including the date of placement on the MPL, within 1 mo. after completion of the field evaluation. Failure to complete all project evaluation requirements successfully is grounds for cancellation of provisional qualification and removal from the MPL.

It is critical that no significant changes be made to the RPMs' composition, manufacturing process, or design during or after pre-qualification without notifying MTD. It is also critical that the RPMs provided be uniform, with minimal variations from marker to marker. Significant changes not reported by the manufacturer or variations in product, as determined by the Director of MTD, may be cause for removal from the MPL. In case of variance, the Department's tests will govern.

- 5.4.2. **Product Evaluations.** Once the material is provisionally qualified and listed on the MPL, provide MTD with project information for the first three Department projects supplied with the RPMs and additional projects if requested. RPMs must meet the same performance criteria as for the initial field evaluations to receive full qualification, unless there are extenuating circumstances as determined by MTD. MTD will return the results after the 12mo. evaluation of each project.

If test results indicate RPMs do not meet the requirements of this Specification, evaluation will cease, and RPMs will not be qualified. Suppliers may resubmit materials for qualification after providing documentation identifying the cause and corrective action taken

- 5.4.3. **Full Qualification.** MTD will grant full pre-qualification and continue to list materials meeting all requirements of this specification on the MPL.

It is critical that no significant changes be made to the RPMs' composition, manufacturing process, or design during or after pre-qualification without notifying MTD. It is also critical that the RPMs provided be uniform, with minimum variations from marker to marker. Significant changes not reported by the manufacturer or variations in product, as determined by the Director of MTD, may be cause for removal from the MPL. In case of variance, the Department's tests will govern.

- 5.4.4. **Failure.** MTD will revoke qualification for RPMs that do not meet the performance criteria and will remove the RPMs from the MPL. Producers not qualified under this Specification may not furnish materials for use on Department projects.

Producers failing to qualify may submit a request for re-evaluation after 6 mo. have elapsed from the date of the original request. MTD may modify this time limit at its discretion. In the request for re-evaluation, document the cause of the issue and corrective action taken.

The Department normally bears the costs of sampling and testing; however, the producer will bear the costs associated with materials failing to conform to the requirements of this Specification. The Director of MTD will assess this cost at the time of testing, and amounts due will be billed to the producer.

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## 6. QUALITY MONITORING PROGRAM REQUIREMENTS

MTD will re-qualify materials in the QMP annually. MTD will perform quality monitoring (QM) testing when applicable. The producer will be responsible for quality control (QC) and independent assurance (IA) testing.

RPMs must meet the following requirements:

- be of stable design, i.e., no substantive design changes (changes in composition or manufacturing process) that might affect the quality of the product, and
- have been manufactured on a continuous basis for at least 6 mo.

- 6.1. **QM Sample.** Submit a 10-RPM sample of each approved color and model or as directed to MTD annually for testing.

- 6.2. **QC Test Reports.** Producers accepted to the QMP must perform their own QC testing to ensure product quality and to verify compliance with this Specification. Testing is required for every material that is pre-qualified under the QMP.
- Producers must maintain a complete record of all QC test reports for a minimum of 3 yr., available for Department review upon request.
- 6.3. **Periodic Evaluation.** Periodic evaluation may include field evaluations, random sampling for laboratory testing, audits of test reports, or **MTD** requested sample submittals.
- 6.3.1. **Department-Initiated Laboratory Testing and Audits.** The Department reserves the right to conduct random sampling and testing of pre-qualified materials to verify performance and Specification compliance and to perform random audits of documentation. Department representatives may sample material from the manufacturing plant, the project site, and the warehouse.
- Failure of materials to comply with the requirements of this Specification as a result of periodic evaluation may be cause for removal of those materials from the MPL. In case of variance, the Department's tests will govern.
- 6.3.2. **Submittals for NTPEP Field Testing.** Resubmit product to NTPEP for retesting when required by the most current NTPEP work plan or every 5 yr., whichever is less. Submit 1-yr. and 2-yr. NTPEP results to **MTD** when the data becomes available.
- 6.4. **Disqualification.** Causes for disqualification and removal from the MPL and the QMP may include, but are not limited to:
- materials demonstrate repeated and large-scale performance problems in the field;
  - materials fail to meet the requirements of this Specification as a result of periodic evaluation;
  - falsification of documentation;
  - producer fails to report any change in material composition, manufacturing process, or design to **MTD**;
  - producer fails to submit the annual QM samples or subsequent NTPEP test reports;
  - producer has not supplied pavement markers to Department projects for 5 yr.; or
  - producer has unpaid charges for failing samples.
- MTD** will remove disqualified producers from the MPL and will not allow submission of material for re-qualification for 6 mo. after removal, unless otherwise approved by the Director of **MTD**.
- 6.5. **Re-Qualification.** Once the disqualification period established by **MTD** has elapsed, producers disqualified and removed from the MPL and the QMP may begin the re-qualification process by submitting a request in accordance with Section 5.1, including additional documentation identifying the cause of the problem and corrective action taken. The re-qualification process will then follow all subsequent Sections of Articles 5 and 6.
- The Department normally bears the costs of sampling and testing; however, the disqualified producer will bear the costs associated with re-qualification. The Director of **MTD** will assess this cost at the time of re-evaluation, and amounts due will be billed to the producer.

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## 7. MATERIAL REQUIREMENTS

All RPMs must meet all the requirements of ASTM D4280 and all requirements specified below, except for specified requirements by type.

### 7.1. Reflectorized Types.

- Type I-A must contain one face that reflects amber light. The body, other than the reflective face, must be yellow.
- Type I-C must contain one face that reflects white light. The body, other than the reflective face, must be white or silver-white.
- Type I-R must contain one face that reflects red light. The body, other than the reflective face, must be white or silver-white.
- Type II-C-C must contain two reflective faces oriented 180° to each other, each of which must reflect white light. The body, other than the reflective faces, must be white or silver-white.
- Type II-A-A must contain two reflective faces oriented 180° to each other, each of which must reflect amber light. The body, other than the reflective faces, must be yellow.
- Type II-C-R must contain two reflective faces oriented 180° to each other, one of which must reflect white light and one of which must reflect red light. The body, other than the reflective faces, must be white or silver-white.

7.2. **Appearance Requirements.** The outer surface of the RPMs must be smooth except for the molding or stamping of the manufacturer’s unique imprint. All corners and edges exposed to traffic must be rounded.

7.3. **Optical Requirements.** The RPMs must be capable of providing amber, red, or white light reflection as required by the requisition or plans.

The reflected light of each reflective face must conform to the minimum reflective specific intensity ( $R_1$ ) requirements listed and in accordance to Table 2, measured in millicandelas per lux (mcd/lx).

**Table 2**  
**Minimum Initial R1 per Reflective Face at 0.2° Observation Angle and 0° Entrance Angle (mcd/lx)**

Entrance Angle	Crystal	Amber	Red
0°	279	167	70
20°	112	67	28

7.4. **Physical Requirements.** MTD will test a random sample of five markers in accordance with [Tex-434-A](#). The minimum strength must be 2,000 lb., with no marker exhibiting a deformation of more than 0.125 in. before achieving the minimum strength. If MTD determines that the design of the RPMs inhibits the performance of the test, they may be accepted based on the ASTM D4280 Longitudinal Flexural Strength Test.

The average compression results must have a quality index value equal to or greater than 1.23. MTD will calculate the quality index value from the lower specification limit of 2,000 lb. load using the following equation.

$$Q_L = (X - LSL) / s$$

Where:

$Q_L$  = quality index value,

$X$  = average result from test,

$LSL$  = lower specification limit, and

$s$  = standard deviation from test.

7.5. **Heat Resistance.** The RPMs must show no change in physical or optical properties when subjected to the requirements of [Tex-846-B](#). The temperature will be 140°F with the marker in a vertical position.

The  $R_1$  of the pavement marker must not be less than 80% of its initial value after being subjected to the heat test.

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**8. ARCHIVED VERSIONS**

Archived versions are available.