
DMS-8220

Hot Applied Thermoplastic

Effective Date: July 2016



1. DESCRIPTION

This Specification governs the materials, composition, quality, sampling, and testing of the following thermoplastic pavement marking materials:

- thermoplastic pavement marking materials, used with reflective glass beads to form a reflective stripe;
- thermoplastic profile pavement marking materials, used with reflective glass beads and a specified profile pattern to produce a reflective stripe and a rumble effect; and
- thermoplastic shadow pavement marking materials, used with a black, colorfast, anti-skid material to form a shadow marking.

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.

3. MATERIAL PRODUCER LIST

The Materials and Pavements Section of the Construction Division (CST/M&P) maintains the Material Producer List (MPL) of all materials conforming to the requirements of this Specification. Materials appearing on the MPL, entitled "[Thermoplastic Pavement Marking Materials](#)," require no further testing unless deemed necessary by the Project Engineer or CST/M&P.

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.

5. PRE-QUALIFICATION PROCEDURE

- 5.1. **Pre-Qualification Request.** Submit **on company letterhead** a request for evaluation under DMS-8220 to DMS_Prequal@txdot.gov.

Include the following information in the request:

- company name;
- physical and mailing addresses;
- contact person, phone number, and email address;
- type of material; and

- certification that all glass traffic beads contain no more than 200 ppm of arsenic or lead as determined by certified independent (third-party) laboratory in accordance with Environmental Protection Agency testing methods 3052, 6010B, or 6010C.

5.2. **Pre-Qualification Sample.** After reviewing the pre-qualification request, the Department will contact the producer to request 50-lb. samples of each color of regular thermoplastic, profile thermoplastic, and shadow marking thermoplastic for laboratory testing and evaluation. Include 5 lb. of the black, colorfast, anti-skid material when submitting shadow marking thermoplastic. Include with the samples current safety data sheets (SDS) that comply with OSHA Hazard Communication Standard 29 CFR 1910.1200.

Submit all materials for pre-qualification at no cost to the Department.

5.3. **Laboratory Evaluation.** CST/M&P will notify prospective bidders and suppliers after completion of the laboratory evaluation.

5.3.1. **Qualification.** Upon successful completion of the laboratory evaluation, CST/M&P will add to the MPL any regular thermoplastic or shadow marking thermoplastic material approved for use on Department projects.

Provide additional independent certified test reports as outlined in Section 5.1 when requested.

Profile thermoplastic requires an additional field evaluation as specified in Section 5.4 prior to qualification.

Report changes in the composition or in the manufacturing process of any material to CST/M&P. Significant changes reported by the producer, as determined by the Director of CST/M&P, may require a re-evaluation of performance. The Department reserves the right to conduct whatever tests it deems necessary to identify a pre-qualified material and determine if there is a change in the composition, manufacturing process, or quality that may affect its durability or performance. In case of variance, the Department's tests will govern.

5.3.2. **Failure.** 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 1 year has elapsed from the date of the original request. CST/M&P 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 CST/M&P will assess this cost at the time of testing, and amounts due will be billed to the producer.

5.4. **Field Evaluation for Profile Markings.** Upon successful completion of the laboratory evaluation, the Department will contact producers of profile thermoplastic to schedule an additional 1-year field evaluation prior to final approval. All material, installation, and necessary traffic control costs will be at no cost to the Department.

5.4.1. **Provisional Qualification.** The Department may grant provisional approval after 6 months and add profile marking materials meeting all performance requirements to the MPL with a provisional designation.

5.4.2. **Qualification.** Upon successful completion of the field evaluation, the Department will remove the provisional designation from the MPL to signify full qualification.

Report changes in the composition or in the manufacturing process of any material to CST/M&P. The Department will review significant changes reported, and the material may require a re-evaluation. The Department reserves the right to conduct whatever tests it deems necessary to identify a pre-qualified material and determine if there is a change in the composition, manufacturing process, or quality that may affect its durability or performance.

- 5.4.3. **Failure.** If the material does not meet all performance requirements after the final field evaluation, the Department will remove the material from the MPL. Producers not qualified under this Specification may not furnish materials for Department projects.

Producers failing to qualify may submit a request for re-evaluation after 1 year has elapsed from the date of the original request. CST/M&P may modify this time limit at its discretion. In the request for re-evaluation, the producer must document the cause of the issue and corrective action taken.

- 5.5. **Periodic Evaluation.** 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. The Department will select random samples from materials submitted on Contracts, will sample in accordance with Tex-862-B, and will test in accordance with Tex-863-B.

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.

- 5.6. **Disqualification.** Causes for disqualification and removal from the MPL include, but are not limited to:
- falsification of documentation
 - producer fails to report any change in material composition or manufacturing process to CST/M&P,
 - material fails to meet the requirements of this Specification as a result of periodic evaluation,
 - material fails to exhibit the necessary performance requirements for a minimum of 4 years in service, or
 - producer has unpaid charges for failing samples.

- 5.7. **Re-Qualification.** Once the disqualification period established by CST/M&P has elapsed, producers disqualified and removed from the MPL 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 Article 5.

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 CST/M&P will assess this cost at the time of re-evaluation, and amounts due will be billed to the producer.

6. MATERIAL REQUIREMENTS

- 6.1. **General Requirements.** Provide thermoplastic pavement marking materials (TPMM) meeting the requirements of AASHTO M 249, with the following additions and exceptions.
- Clearly mark each bag to indicate color, weight, pigment type (for yellow only), and lot or batch number. (A lot or batch is each individual mix or blend that produces a finished product ready for use.)
 - Each bag must contain a minimum of 50 lb. of material.
 - The bag must be composed of a compatible material if designed and intended for placement of the bag and its contents into the melter. Bulk bags must be properly designed and strong enough to avoid spillage and enable easy loading into the melter.
 - Notify CST/M&P if production lots exceed 4,500 lb.
- 6.2. **Pigments.** When washed free of resins by solvent washing, prime and filler pigments must pass a U.S. Standard Sieve Number 200 (Tex-863-B) and must meet the following specific requirements for each pigment.
- 6.2.1. **Prime.**
- The white pigment must be a rutile titanium dioxide meeting the standards of ASTM D 476, Type II or V.

- The yellow pigment must be heat-resistant and weather-stable. The yellow pigment must be a lead and chromate free, organic yellow pigment (C.I. Pigment Yellow 83, opaque version). Do not mix pigment types within a batch. Alternate pigments other than those listed must be evaluated and approved prior to use in the formulation.
- The black pigment must meet the performance requirements described below.

6.2.2. **Filler.** The filler pigment must be calcium carbonate of 95% purity.

6.3. **Binder.** The binder for regular thermoplastic and shadow marking thermoplastic must consist of a mixture of resins, at least one of which is a solid at room temperature, and high boiling point plasticizers. At least one third of the binder composition must be a maleic-modified glyceryl ester of rosin and must be no less than 8% by weight of the entire material formulation.

The binder for profile thermoplastic may be either a binder meeting the requirements specified above for regular thermoplastic or shadow marking thermoplastic or a hydrocarbon resin approved by CST/M&P. The softening point for profile thermoplastic must meet a minimum of 200°F.

The infrared analysis of the resin extract, when taken in accordance with Tex-888-B, must match the spectra on file at CST/M&P.

6.4. **Silica.** The total silica used in the formulation must be in the form of glass traffic beads.

6.5. **Glass Traffic Beads.** Provide glass traffic beads used in the formulation meeting the requirements for AASHTO M 247, Type I.

6.6. **Color.**

6.6.1. **White, Yellow, and Black.** The daytime CIE chromaticity coordinates of the material, when determined in accordance with Tex-839-B, must fall within an area having the following corner points.

**Table 1
Daytime CIE Chromaticity Coordinate Corner Points**

	1		2		3		4		Brightness
	x	y	x	y	x	y	x	y	Y
White	0.290	0.315	0.310	0.295	0.350	0.340	0.330	0.360	Min 65
Yellow	0.435	0.429	0.510	0.489	0.460	0.400	0.560	0.440	30–60
Black	0.355	0.355	0.305	0.305	0.285	0.325	0.335	0.375	Max 5.0

The white and yellow material must meet the specified color requirements listed in Table 1 for each color before and after weatherometer exposure of 70 hr. for white and 1,000 hr. for yellow. Weatherometer exposure will be in accordance with ASTM G 155 using Exposure Cycle 1 with a quartz inner filter glass and Type “S” Borosilicate outer filter glass.

The nighttime CIE chromaticity coordinates for yellow thermoplastic, when determined utilizing a retroreflectometer capable of measuring night color of pavement markings in accordance with ASTM E 1710, must fall within an area having the following corner points during the life of the stripe.

**Table 2
Nighttime CIE Chromaticity Coordinate Corner Points**

	1		2		3		4		5	
	x	y	x	y	x	y	x	y	x	y
Yellow	0.53	0.47	0.49	0.44	0.50	0.42	0.51	0.40	0.57	0.43

Material found not to meet any of the color requirements during the life of the stripe may subject the manufacturer to removal from the MPL.

6.6.2. **Black.** The black pigment must produce a completely opaque, black stripe when applied on the road and after 70 hr. of weatherometer exposure in accordance with ASTM G 155 using Exposure Cycle 1 with a quartz inner filter glass and Type “S” Borosilicate outer filter glass.

6.7. **Uniformity.** When sampled in accordance with Tex-862-B, any 100-g sample must be representative of the batch or lot of material.

6.8. **Formula.**

**Table 3
Thermoplastic Pavement Marking Material**

White	% by Weight	Yellow	% by Weight
Binder for Non-Profile	20 Min	Binder for Non-Profile	20 Min
Binder for Profile	18 Min	Binder for Profile	18 Min
Titanium Dioxide	10 Min	C.I. Pigment Yellow 83	1.5 Min
Calcium Carbonate	20–42	Calcium Carbonate	20–42
Glass Traffic Beads	30–45	Glass Traffic Beads	30–45
Total	100	Total	100

Note 1—The above requirements will be determined by testing in accordance with Tex-863-B.

Note 2—Alternate pigments and pigment loading for yellow formulations may be considered if CST/M&P evaluates and approves the alternate formulation prior to use.

Note 3—Black thermoplastic formulations must meet the same binder, glass traffic bead, and calcium carbonate requirements listed above for white and yellow non-profile thermoplastic.

7. ARCHIVED VERSIONS

Archived versions are available.