DS- 23061
(New)

DEVELOPMENTAL SPECIFICATIONS FOR PREFORMED THERMOPLASTIC PAVEMENT MARKINGS

Effective Date
August 20, 2024

THE STANDARD SPECIFICATIONS, SERIES OF 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

23061.01 DESCRIPTION.

Under this work, the Contractor shall furnish and apply preformed thermoplastic pavement markings at the location and in accordance with patterns indicated on the plans or as ordered by the Engineer, and in conformance with the MUTCD and these specifications. This work may also include, when shown on the plans, grooves cut for lines and symbols and legends.

23061.02 MATERIALS.

A. Preformed Thermoplastic.

1. Preformed Thermoplastic shall meet the requirements of Materials I.M. 483.05. Approved manufacturers and brand names are listed in MAPLE.

2. Preformed thermoplastic shall be capable of application on bituminous and concrete pavements.

3. The markings must be resistant to the detrimental effects of motor fuels, lubricants, hydraulic fluids, antifreeze, exposure to sunlight, water, salt or adverse weather conditions.

4. Lines, legends and symbols must be capable of being affixed to bituminous and/or Portland cement concrete pavements by heating.

5. Follow manufacturers recommendations for storage, handling and application temperatures and conditions.

6. Store markings in accordance with the manufacturer's instructions and manufacturer's requirements for shelf life and storage conditions. Ensure markings are clearly labeled and in a dry and clean condition prior to use. Shipping documents and containers shall have identification numbers or batch dates for confirmation of when products were manufactured, brand name, name of manufacturer, lot or batch number, temperature range for storage, expiration date, the quantity contained and include material safety data sheets. Place markings within the manufacturers published shelf life for the material. Do not place markings outside of expiration dates for the markings without written consent from the manufacturer provided to the engineer PRIOR to placement.

7. Use Markings conforming to the Chromaticity limits and within the coordinates for the respective colors for daytime and nighttime as indicated in ASTM D6628 Tables 1 and 2. Lightness Limits shall conform to ASTM D6628 Table 3 for each respective color of marking.

8. **Pigments.**
   - **a.** White: The material shall be manufactured with sufficient titanium dioxide pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.
   - **b.** Red, Blue, and Yellow: The material shall be manufactured with sufficient pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. The yellow pigments must be organic and must be heavy-metal free.
   - **c.** Other Colors: The pigments must be heavy-metal free.

9. Skid Resistance: The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E 303. If enhanced skid resistance is specified on plans provide a minimum resistance value of 60 BPN.

10. Thickness: The material must be supplied at a minimum thickness of 125 mils.

B. Primer.
Primer shall be applied as recommended by the manufacturer.

C. Glass Beads.

1. Glass beads, if applied to the surface of pre-formed thermoplastic markings, shall comply, at a minimum, with the requirements of AASHTO M247 Type 1 and / or Type 3 and / or Section 4184 of the Standard Specifications.

2. The material must contain a minimum of 30% intermixed graded glass beads by weight. The intermixed beads shall be conforming to AASHTO designation M247, with minimum 80% true spheres and minimum refractive index of 1.50.

3. The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of 1 pound (± 10%) per 10 square feet. These factory applied coated surface beads shall have a minimum of 80% true spheres, minimum refractive index of 1.50.

D. Acceptance.
Acceptance of material shall be based on final inspection per Article 23061.03, F and satisfactory field performance. Pavement markings shall be approved prior to installation on a project. Approval does not preclude the need for acceptance sampling and testing on a project-by-project basis.

23061.03 CONSTRUCTION.

A. Contractor Qualifications.
Provide a letter of certification from the preformed thermoplastic pavement marking manufacturer indicating the Contractor's qualifications to install their product.

B. Equipment.
All equipment shall be of such design and maintained in such condition as to properly heat, mix, and apply the material.

C. Surface Preparation.

1. Grooving for pavement markings and legends / symbols and shall be 130 mils -0/+10 mils.

2. The pavement surface on which the thermoplastic material is to be placed shall be clean and dry. Even if the pavement is visibly dry, subsurface moisture may be present in amounts sufficient to affect bonding. To test for dryness, a 3 to 6 foot section of tar paper shall be laid on the pavement and molten thermoplastic applied on top. After 30 seconds, lift the paper and check for moisture on the bottom of the paper. If the paper is dripping wet, wait until the pavement has dried before applying the thermoplastic. If the paper shows only a damp spot, proceed with the thermoplastic application.

3. Pavement surfaces shall be inspected for cleanliness and any dirt, debris, or other contaminants on the surface to be marked shall be removed.

D. Application.

1. **Asphalt.**
The material shall be applied as recommended by the manufacturer. The material must be able to be applied without preheating of the pavement. A primer may be required pursuant to manufacturers installation requirements.

2. **Portland Cement Concrete.**
The same application procedure shall be used as described in Article 23061.03, D, 1. However, a primer shall be applied and cured in accordance with the recommendations of the manufacturer of the thermoplastic material.

3. **Glass Beads.**
Glass beads shall be applied as recommended by the manufacturers of the thermoplastic material.

E. General Requirements.
The applied thermoplastic markings will be inspected continually for overall workmanship. Markings shall have clean cut edges and the color shall be distinctive. The glass beads shall appear uniform on the entire marking surface.

F. Final Inspection.

1. Provide an acceptable 30 meter geometry retro-reflectometer to use on the project which will remain the property of the Contractor. In the presence of the Engineer, measure the retro-reflectivity of selected preformed thermoplastic markings. Take a minimum of five randomly spaced readings per color line every 1 mile, or per legend or symbol randomly selected per tenth symbol. Provide the engineer a document indicating results of retro-reflective testing for the project files. The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of sufficient nighttime retroreflection when tested in accordance to ASTM E 1710. The minimum retro-reflectivity shall be:

Minimum Coefficient of Retroreflected Luminance (mcd / sq. ft. / ft.-cdl.)	
White lines / Symbols / Legends	300
Yellow lines / Symbols / Legends	200

2. If the marking does not meet these initial retro-reflectivity readings, if the marking does not have the required minimum thickness, or if the marking does not comply with the specifications for any other reason, the Engineer may require complete removal or correction at the Contractor's expense.

23061.04 METHOD OF MEASUREMENT.
Measurement for pavement markings or symbols and legends, satisfactorily placed, will be as follows:

A. Preformed Thermoplastic Pavement Markings.
The number of stations of markings placed will be calculated by the Engineer, using the beginning and ending points for each type of line placed, based on a single 4 inch width as outlined in plans. The types are as shown in the plans. The calculations for broken or dotted lines are adjusted in the table to exclude skips as specified. The calculation for solid lines will be adjusted to exclude breaks. The quantities for several types of lines will be totaled to a single quantity of thermoplastic longitudinal 6 inch lines in stations.

B. Preformed Thermoplastic Symbols and Legends.
Each precut symbol or legend is indicated on the plans, and the units will be counted. Each of the following is a complete unit: each STOP; each SCHOOL legend (one lane or two lane); each RxR marking for railroad and highway grade crossing; each ONLY; each AHEAD; each freeway, expressway, and ramp arrow; each straight, curve, or combined arrow; each route shield.

C. Grooves Cut for Pavement Markings or Symbols and Legends.
Per Articles 2527.04, A, 11 and 12 of the Standard Specifications.

23061.05 BASIS OF PAYMENT.

A. Payment for pavement markings or symbols and legends, satisfactorily placed, will be at the contract unit price as follows:

1. **Preformed Thermoplastic Pavement Markings.**
For the number of stations of thermoplastic longitudinal lines and transverse markings placed, the Contractor will be paid the contract price per station.

2. **Preformed Thermoplastic Symbols and Legends.**
For each unit of precut symbol and legend placed, the Contractor will be paid the contract price.

3. **Grooves Cut for Pavement Markings or Symbols and Legends.**
Per Articles 2527.05, A, 11 and 12 of the Standard Specifications.

B. This compensation will be full payment for all work involved in cleaning and preparing the surface and furnishing, applying, and maintaining the pavement marking, and for furnishing all equipment, tools, and labor necessary to complete the work. Removal of existing markings is included as a bid item in the plans and paid for at the contract unit price. The accepted quantity of thermoplastic pavement marking will be paid for at the contract unit price.