

## 806 - DURABLE PAVEMENT MARKING

### SECTION 806

#### DURABLE PAVEMENT MARKING

##### 806.1 DESCRIPTION

Prepare the pavement and apply the pavement markings as shown in the Contract Documents.

When rumble strips are to be constructed on the project, construct the centerline rumble strips before installing centerline pavement marking.

##### BID ITEMS

Pavement Marking (\*) (\*\*) (\*\*\*) (\*\*\*\*)

Pavement Marking Symbol (\*) (White) (\*\*\*\*) (\*\*\*\*\*)

\*Type of Pavement Marking: Cold Plastic, Patterned Cold Plastic, Epoxy, Thermoplastic, Preformed Thermoplastic, Thermoplastic-Spray, Intersection Grade, High Durability or Multi-Component

\*\* Color

\*\*\* Width

\*\*\*\* Type of Symbol

\*\*\*\*\* Contrast

##### UNITS

Linear Foot

Each

##### 806.2 MATERIALS

Provide durable pavement marking materials that comply with **DIVISION 2200**.

##### 806.3 CONSTRUCTION REQUIREMENTS

###### a. General.

(1) Equipment. Use equipment designed for the preparation and application of the appropriate type of pavement marking material.

(2) Contractor's Personnel. Provide a minimum of 1 employee on the project holding an American Traffic Safety Services Association (ATSSA) pavement marking certification and experienced in the application of the appropriate type of pavement marking material.

(3) Pavement Marking Contractors. Provide a letter of certification from the pavement marking manufacturer indicating the Contractor's qualifications to install their product.

(4) Test Strip. Before beginning pavement marking operations, at a location approved by the Engineer complete a 300-foot test section for epoxy, thermoplastic, sprayed thermoplastic and multi-component pavement markings that meet the requirements of this specification. The Engineer will inspect the test strip 24 hours after it has been placed. Do not begin pavement marking operations, until the Engineer approves the test strip.

(5) Surface Preparation. On existing pavements, remove the existing permanent, pavement markings (removed and paid for under **SECTION 808**) and according to the recommendations of the manufacturer of the new pavement markings.

Remove temporary pavement markings, if any, the same day the durable pavement markings are applied. Removal of temporary pavement marking is subsidiary to temporary pavement marking bid items.

Remove loose particles, dirt, tar, grease, residue of prior pavement markings and other deleterious material from the pavement surfaces.

(6) Alignment. Lay out the pavement marking as detailed in the Contract Documents. If the Contract Documents do not provide details, submit to the Engineer for approval, a layout plan for the pavement markings that complies to the MUTCD. Locate longitudinal pavement marking stripes a minimum of 2 inches and a maximum of 8 inches from longitudinal joints. Provide adequate guide marks (approximately 2 inches by 12 inches at approximately 30 to 50-foot intervals) for the application of the pavement markings.

When applying pavement markings at locations with newly constructed rumble strips, use the same guide marks that were used for milling the rumble strips, or when approved by the Engineer, establish a new guide mark, if the guide mark used with the rumble strips is not visible enough to follow.

(7) Pavement Marking Width. Apply the pavement markings at the specified plan width or a maximum of ¼ inch above the specified plan width. See **TABLE 806-3** for minimum pavement marking widths.

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(8) Pavement Marking Application. Provide the Engineer with a copy of the manufacturer’s application instructions. Apply the pavement markings according to the manufacturer’s recommendations.

Follow the manufacturer’s recommendations regarding pavement and ambient temperature at the time of application. The Engineer will verify the pavement and ambient temperatures before beginning work and when deemed necessary.

Apply pavement markings straight and close to the intended alignment without abrupt changes that result in an unacceptable appearance.

Meet the minimum retroreflectivity requirements in **TABLE 806-1**.

(9) Unsatisfactory Pavement Marking. Remove and replace unsatisfactory pavement marking according to the Contract Documents.

(a) General. Remove and replace pavement markings that:

- have drag marks, gashes, gouges, foreign covering, discolored areas or areas that have failed to solidify.
- have improper adhesion, length or thickness.
- have areas that present a ragged appearance, areas that do not present sharply defined edges, or areas with abrupt unintended changes in alignment.

(b) Alignment. Lines that deviate laterally from the intended alignment more than 2 inches in 200 feet may be rejected.

(c) Width. The Engineer will take a minimum of 10 width measurements per color line randomly spaced every 1 mile. Remove and replace the deficient widths of pavement markings so the total length of deficiency in any 1 mile section is less than 300 feet.

(d) Retroreflectivity. See **TABLE 806-1** for minimum retroreflectivity requirements for pavement marking.

<b>TABLE 806-1: MINIMUM RETROREFLECTIVITY REQUIREMENTS</b>		
<b>Type of Material</b>	<b>Color</b>	<b>millicandelas/sq m/lux* (minimum) (Initial)</b>
Cold Plastic	White	250
	Yellow	175
Patterned Cold Plastic	White	500
	Yellow	300
Epoxy or Multi-Component	White	325
	Yellow	250
High Durability Tape	White	225
	Yellow	175
Thermoplastic, Preformed Thermoplastic or Spray Thermoplastic	White	300
	Yellow	225

**NOTE:** Provide an acceptable 100-foot retroreflectometer to use on the project which will remain the property of the Contractor. In the presence of the Engineer, measure the retroreflectivity between 12 hours and 14 days after the application of all pavement markings. Take a minimum of 5 randomly spaced readings per color line every 1 mile. The Engineer will average all of the readings for each color line within the 1 mile section to determine the retroreflectivity.

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If the pavement markings have a retroreflectivity reading as measured for **TABLE 806-1** (in any 1 mile section) less than that shown in **TABLE 806-2**, remove and replace the entire 1 mile section.

<b>TABLE 806-2: RETROREFLECTIVITY READINGS REQUIRING REMOVAL OF PAVEMENT MARKING</b>		
<b>Type of Material</b>	<b>Color</b>	<b>Retroreflectivity reading (R) in a 1 mile section (millicandelas)</b>
Cold Plastic	White	200
	Yellow	125
Patterned Cold Plastic	White	450
	Yellow	250
Epoxy or Multi-Component	White	275
	Yellow	200
High Durability Tape	White	175
	Yellow	125
Thermoplastic, Preformed Thermoplastic or Spray Thermoplastic	White	250
	Yellow	175

(10) Acceptance of Pavement Marking. The Engineer will not examine pavement marking for final acceptance until the pavement markings complete a 180 calendar day observation period. The Contractor is responsible for the pavement marking during this period. The 180 calendar day observation period begins the day following the completion of the pavement marking. Providing all other work on the contract is complete, the Engineer will not assess working day charges during the 180 calendar day observation period.

Immediately following the 180 day observation period, arrange with the Engineer to have a joint meeting to examine the pavement marking. The Engineer will provide written results of the final examination to the Contractor within 5 business days of the joint meeting.

Before the project is accepted, replace all failed pavement markings, at own expense. The pavement marking is failed, when more than 10% of the substrate is exposed in a 2,000-foot section of longitudinal pavement marking line. The transverse lines and symbols will be evaluated separately for the exposure of 10% substrate. Abrasion of pavement marking at private entrances or intersections may be excluded from examination.

If the Contractor fails to complete the required replacement of pavement markings within 10 business days of the date of the notice of the unacceptable pavement markings, during which the application of pavement markings is not precluded by adverse weather or road surface conditions, the Engineer, after giving the Contractor written notice, will reinstate the assessment of working day charges or Liquidated Damages. Working day charges or Liquidated Damages will continue until the work is accepted.

If more than 30% of pavement marking is required to be replaced, the replacement pavement markings will not be accepted until the completion of an additional 180 calendar day observation period.

The Engineer will, upon satisfactory inspection of the pavement marking, accept the work and terminate the Contractor's responsibilities.

**b. Cold Plastic/Patterned Cold Plastic Pavement Marking.** Grind an inset for the pavement marking into the surface of the pavement. Grind the inset 0.08 inches (+ 0.01 inch tolerance) deep, with the width and length of the inset a maximum of 2 inches greater than the dimensions of the pavement marking.

On new or existing PCCP, cut the marking tape at any joint in the pavement that is crossed by the tape.

Apply adhesive-sealer primer of a type recommended by the manufacturer. Primer is required on all tape applications regardless of temperature, date or season.

**c. Epoxy Liquid Pavement Marking.** When pavement markings are applied to PCCP (including concrete bridge decks) less than 1 year old, remove all curing compounds and laitance by shot, sand or waterblasting.

Use a slower curing epoxy material (40 minutes) for pavement markings applied to PCCP. For other surfaces, fast setting (10 minutes) epoxy material may be used with approval of the Engineer.

Apply the epoxy liquid material closely behind the surface cleaning procedures.

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Before mixing the components of the pavement marking material, heat the individual components to the temperature ranges recommended by the manufacturer of the material. Do not exceed the maximum recommended temperature at any time.

Apply the epoxy liquid pavement marking material at a thickness of 20-25 mils on all pavement. Immediately apply all glass beads (double drop system or blended bead) to the epoxy liquid pavement marking at the glass bead gradation and bead drop rate recommended by the manufacturer to obtain the required level of retroreflectivity.

**d. Multi-Component Liquid Pavement Marking.** When pavement markings are applied to PCCP (including concrete bridge decks) less than 1 year old, remove all curing compounds and laitance by shot, sand or waterblasting. For intersection grade multi-component, grind the inset 15 mil (+10 mil tolerance) deep, with the width and length of the inset a maximum of 2 inches greater than the dimensions of the pavement marking on concrete surfaces.

Multi-component liquid pavement marking will only be allowed for use on concrete pavement on a pre-qualified basis.

Apply the multi-component liquid material closely behind the surface cleaning procedures.

Before mixing the components of the pavement marking material, heat the individual components to the temperature ranges recommended by the manufacturer of the material. Do not exceed the maximum recommended temperature at any time.

Apply the multi-component liquid pavement marking material at the thickness of 20-25 mils on all pavement. Immediately apply the glass beads (double drop system or blended drop) to the multi-component liquid pavement marking at the glass bead gradation and bead drop rate recommended by the manufacturer to obtain the required level of retroreflectivity.

**e. Intersection Grade Pavement Marking.**

(1) Multi-Component. Follow **subsection 806.3d**.

(2) High Durability Tape. Grind an inset for the pavement marking into the surface of the pavement. Grind the inset 80 mil (+10 mil tolerance) deep with the width and length of the inset a maximum of 2 inches greater than the dimensions of the pavement marking. Apply adhesive-sealer primer of a type recommended by the manufacturer. Primer is required on all tape applications regardless of temperature, date or season.

On new or existing PCCP, cut the marking tape on either side of any joint in the pavement that is crossed by the tape.

(3) Preformed Thermoplastic. Grind the inset 40 mil (+ 20 mil tolerance) deep with the width and length of the inset a maximum of 2 inches greater than the dimensions of the pavement marking on concrete surfaces.

Use a heating device recommended by the material manufacturer to fuse the preformed thermoplastic to the pavement. Apply adhesive-sealer primer of a type recommended by the manufacturer. Primer is required on all preformed applications on concrete regardless of temperature, date or season.

Apply the pavement markings as recommended by the manufacturer.

**f. All Thermoplastic Pavement Marking.** The Engineer will verify the thickness of the thermoplastic pavement marking. Thickness will be checked by placing metal plates or other suitable material of known thickness in a 3-foot section along the path of application at 2 to 3 locations. After the application of the thermoplastic material, the samples will be cut free. The material thickness will be measured using either a micrometer or vernier calipers (with proper correction for the metal plate). The thickness recorded for the locations within the 3-foot section will be averaged. Initially, thickness determinations will be made every 1/3 mile for each color and each stripe width. Once a pattern of compliance is established, the Engineer may reduce the frequency of thickness verification to once each 1 mile section. Failure of a section will require testing to return to the initial frequency until compliance may be re-established. The location of the 3-foot sample segment within the sample section will be selected at random.

The Contractor may provide other devices for gauging thickness to the Engineer for approval.

Apply thermoplastic pavement markings between April 15 and October 15. If the manufacturer's recommendations allow, the Engineer may waive the date restrictions. The Engineer will notify the Contractor in writing of any allowed variance.

(1) Thermoplastic Pavement Marking. The required thickness for longitudinal markings is a minimum of 90 mil at the edges, and a maximum of 125 mil at the center of the stripe. The required thickness for transverse markings and symbols is a minimum of 90 mil at the edges, and a maximum of 140 mil at the center.

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For transverse markings on concrete, grind the inset 40 mil (+20 mil tolerance) deep, with the width and length of the inset a maximum of 2 inches greater than the dimensions of the pavement marking on concrete surfaces.

Apply the binder-sealer according to the manufacturer's recommendations. Primer is required on all transverse applications on concrete regardless of temperature, date or season. The Engineer will not approve the application of the thermoplastic material until the binder-sealer applied to the pavement is devoid of all solvent or water.

Apply prepared thermoplastic material in a molten state within a temperature range of 400 to 440°F. The Engineer will not approve the use of scorched material or prepared material that has been maintained at 440°F for a period exceeding 4 hours.

Apply glass beads (double drop system or blended bead) to the thermoplastic pavement marking at the glass bead gradation and bead drop rate recommended by the manufacturer to obtain the required level of retroreflectivity.

**g. Leading/Trailing Configuration.** Installation of leading/trailing pavement markings may be used for intermittent markings on concrete or asphalt surfaces. The trailing (black) pavement marking shall be placed concurrently to the white pavement marking line when applied to the roadway.

Apply black, opaque coal slag (20-40 mixture) to the trailing pavement marking line at a rate of 8-10 pounds per gallon of liquid pavement marking to achieve a skid resistance value of 50 BPN.

Apply leading/trailing pavement markings that follow the same space configuration as broken lines, dotted extension and lane drop markings in the Contract Documents.

### 806.4 MEASUREMENT AND PAYMENT

The Engineer will measure the various widths and colors of pavement markings by the linear foot. When the Contract Documents specify that the contrast pavement markings are installed in a leading/trailing configuration, the Engineer will measure the black pavement marking and white pavement marking separately by the linear foot.

The Engineer will measure each symbol.

The Engineer will pay for 90% of the completed quantity for each of the various widths and colors of pavement marking and symbols. Upon acceptance of the pavement markings following the 180 day observation period, the Engineer will pay for the remaining 10% of the completed quantity for each of the various widths and colors of pavement marking and symbols.

When necessary, removal of permanent pavement markings will be measured and paid for under **SECTION 808**. Removal of temporary pavement markings is subsidiary to the temporary pavement marking item.

Payment for "Pavement Marking" and "Pavement Marking Symbol" at the contract unit prices is full compensation for the specified work.

Pay adjustments for width and retroreflectivity deficiencies (see **TABLES 806-3** and **4**) will be entered on the Contractor's Payment Vouchers (intermediate and final) under the bid item Contract Deduct.

<b>TABLE 806-3: DURABLE PAVEMENT MARKING WIDTH DEFICIENCY DEDUCTION (Epoxy, Thermoplastic, Spray Thermoplastic and Multi-Component)</b>			
<b>Specified Width (inches)</b>	<b>Actual Width (inches)</b>	<b>Distance (D) the width is deficient in any 1 mile section</b>	<b>Deduction</b>
4	3 ¾ to 4	$D \leq 50$	No deduction.
4	3 ¾ to 4	$50 < D < 300$	20% deduction of the contract line item for the entire 1 mile section.
6	5 ¾ to 6	$D \leq 50$	No deduction.
6	5 ¾ to 6	$50 < D < 300$	20% deduction of the contract line item for the entire 1 mile section.

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<b>TABLE 806-4: DURABLE PAVEMENT MARKING RETROREFLECTIVITY DEDUCTION*</b>			
<b>Type of Material</b>	<b>Color</b>	<b>Retroreflectivity reading (R) in a 1 mile section (millicandelas)</b>	<b>Deduction of the contract line item for the entire 1 mile section</b>
Cold Plastic	White	$225 \leq R < 250$	15%
		$200 \leq R < 225$	25%
	Yellow	$150 \leq R < 175$	15%
		$125 \leq R < 150$	25%
Patterned Cold Plastic	White	$475 \leq R < 500$	15%
		$450 \leq R < 475$	25%
	Yellow	$275 \leq R < 300$	15%
		$250 \leq R < 275$	25%
Epoxy or Multi-Component	White	$300 \leq R < 325$	15%
		$275 \leq R < 300$	25%
	Yellow	$225 \leq R < 250$	15%
		$200 \leq R < 225$	25%
High Durability Tape	White	$200 \leq R < 225$	15%
		$175 \leq R < 200$	25%
	Yellow	$150 \leq R < 175$	15%
		$125 \leq R < 150$	25%
Thermoplastic, Preformed Thermoplastic or Spray Thermoplastic	White	$275 \leq R < 300$	15%
		$250 \leq R < 275$	25%
	Yellow	$200 \leq R < 225$	15%
		$175 \leq R < 200$	25%

\*Retroreflectivity readings used for calculating the deduction will be taken from reading required in **TABLE 806-1**.