

SECTION 633 PAVEMENT MARKING

633.1 DESCRIPTION

This work consists of furnishing and applying pavement marking materials and surface grooving of Portland cement concrete pavement or asphalt concrete pavement.

633.2 MATERIALS

Materials shall conform to the following Sections:

Cold applied thermoplastic pavement markings and legends Section 983.

Paint Section 980.2 and 980.3

Glass beads Section 981.

633.3 CONSTRUCTION REQUIREMENTS

A. Cold Applied Thermoplastic Pavement Marking and Legends:

- 1. Width Tolerance:** Width shall be as specified with a tolerance of ± 0.03 inch (± 3 mm).
- 2. Surface and Air Temperature:** The surface shall be 70EF (21EC) minimum, and ambient air temperature of 60EF (15EC) minimum and rising, at a season when daily highs are above 70EF (21EC) and lows are above 40EF (4EC).
- 3. Bonding:** To insure a uniform bond of material to asphalt or concrete surfaces after initial laydown, rolling of the material with a truck wheel, car wheel, or heavy hand roller is required.
- 4. Pavement Condition:** Pavement must be dry, free of dirt, dust, and oily substances.
- 5. Lane Lines:** Lane lines shall not be placed over a longitudinal pavement joint and shall not be installed closer than $\frac{1}{2}$ inch (13 mm) to the joint.
- 6. Waste Disposal:** It shall be the responsibility of the Contractor to provide for disposal of empty material cartons, liner papers, etc.
- 7. Molding and Sealing:** The material shall mold to the pavement contours, breaks, and faults by the action of traffic. The material shall have resealing characteristics which enable the material to fuse with itself and with previously applied marking materials of the same composition without externally applied tackifiers or adhesives.
- 8. Prefabrication:** Prefabricated legends and symbols shall conform to the applicable shapes and sizes as outlined in the MUTCD.

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9. **Application Instructions:** The manufacturer shall supply proper application instructions, and shall identify activators and adhesives which are to be used. The thermoplastic markings shall be manufactured and packaged in a manner which will permit storage at normal temperatures for up to one year after purchase.
 10. **Uniformity:** The material shall have a uniform cross section and be free of air inclusions and other film abnormalities.
 11. **Thickness:** The material shall be a minimum of 0.060 inch (1.5 mm) thick when measured without the precoated adhesive.
 12. **Deterioration:** Material must exhibit no significant deterioration due to exposure to climatic conditions, sunlight, water, oil, gasoline, or salt.
 13. **Serviceability:** Material must be free of ragged edges, die line, cracks, discolorations, and other defects which would affect serviceability.
 14. **Color Tolerance:** Yellow pavement marking material shall be within an acceptable tolerance of the Highway yellow shown in "Standard Color Tolerance Charts" obtainable from the FHWA.
- B. Inlay on Asphalt Surface Installation Requirements:**
1. **Surface Temperature:** Surface temperature of the asphalt shall not be less than 120EF (49EC) or more than 150EF (66EC).
 2. **Application:** Plastic pavement marking shall not be applied until compaction of the asphaltic mixture has been completed and all residual moisture has evaporated.
 3. **Initial Contact:** Pressure by foot or light hand roller shall be applied to insure initial contact with the surface.
 4. **Final Rolling:** Final inlay shall be accomplished with the use of a 5 to 10 ton (4500 to 9000 kilogram) tandem roller.
 5. **Rolling Procedure:** The roller motion shall be slow at all times, and shall not be reversed when wheels are on the marking material. The roller shall run straight at all times. Turning or twisting of roller wheels on the material shall not be permitted.
 6. **Use of Water:** Water shall be shut off or reduced to a minimum on roller wheels when rolling in pavement marking material.
- C. Pavement Marking Paint and Beads:** Pavement marking paint shall be applied by machine. On special areas and markings that are not adaptable to machine application, hand application will be permitted.

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The paint shall be used as furnished by the manufacturer. Thinner or diluent shall not be added. The paint shall be thoroughly mixed in the original container before it is transferred to the tank of the spraying equipment. Filling tanks, pouring paint, or cleaning equipment shall not be allowed on the pavement.

The pavement marking shall be applied during daylight hours when the ambient air temperature is above 45°F (7°C) and the road surface is dry. The pavement shall be cleaned of dirt, loose stones, and other foreign material before the paint is applied.

The paint applicator shall be a self-propelled pneumatic spraying machine with atomizing nozzles capable of applying a minimum of three lines at one time from 4 to 8 inches (100 mm to 200 mm) wide. The applicator shall be capable of operating at speeds between 5 and 15 mph (8 and 24 kilometers per hour), applying the materials in an even and uniform thickness with clearly defined edges. The application shall have reservoirs or tanks of sufficient capacity and shall be equipped with agitators capable of maintaining a smooth even mixture. The applicator shall be equipped with an automatic skip control device capable of controlling the specified length of painted segment and gap within a linear tolerance of ± 3 inches (± 75 mm). The spray mechanism shall be operated by means of quick opening and closing valves providing a clean, sharp cutoff without dripping.

The applicator machine shall be equipped with a glass bead dispenser capable of applying the beads onto the wet paint immediately after it is applied to the pavement. The dispenser shall be adjusted and synchronized with the paint applicator to distribute the beads uniformly over the wet paint at a rate of **six** pounds per gallon (0.72 kilograms per Liter) of paint. The dispenser shall be equipped with an automatic cut-off control synchronized with the cut off of the striping material.

Adequate hand operated equipment will be required to accomplish the pavement markings for areas not readily accessible to the pavement marking machine.

During pavement marking operations on sections of roadway open to traffic, the Contractor shall protect the markings **from tracking either by placing suitable traffic control devices or by utilizing a shadow vehicle. The work shall be arranged such that** half of the traveled roadway will be open to traffic at all times.

Pavement markings shall be subject to rigid inspection at all times. A night inspection will be made and those areas that are visibly deficient shall be corrected before final acceptance is made.

- 1. Traffic Paint (Alkyd):** This specification is for fast drying white and yellow alkyd resin ready mixed paint used for pavement marking. The paint shall be used with drop on or spray on glass beads for application to Portland cement concrete and asphalt concrete pavements.

The paint shall be applied with glass beads. The glass bead shall be incorporated into the wet paint lines at the time of paint application. The glass beads shall be

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applied at a rate of six pounds per gallon (0.720 kg/Liter) of paint, unless otherwise specified in the contract.

The paint shall be uniformly ground to allow even application. The paint shall be furnished ready to use without thinning or other modifications.

The paint shall dry to a consistency that will allow traffic to drive on it without damage to or pickup within 20 minutes of application. Paint damage by traffic within 20 minutes of application or other failure will result in a price reduction adjustment or rejection.

2. **Traffic Paint (Waterborne):** The paint shall be applied with glass beads. The glass bead shall be incorporated into the wet paint lines at the time of paint application. The glass beads shall be applied at a rate of six pounds per gallon of paint (0.720 kg/Liter), unless otherwise specified in the plan notes.

The paint shall be capable of being applied at paint temperature up to 120EF (49EC). When applied with glass beads at pavement temperatures above 45EF (7EC) and at relative humidities of up to 75 percent, the paint shall dry to a no-track condition within three minutes.

The paint shall be uniformly ground to allow even application. The paint shall be furnished ready to use without thinning or other modifications.

- D. **Grooving for Pavement Marking Tape:** The equipment shall be capable of performing uniform grinding for alignment and depth.

The grooving shall be performed by a self-propelled machine equipped with gang mounted blades on a turning head. The equipment shall be capable of grooving the total width of the groove in one pass or be capable of grooving uniform depths with multiple passes. The equipment shall be capable of grooving double lines simultaneously or parallel lines to a uniform depth with two passes.

The grooving shall be performed within the following tolerances:

	(English)
Depth of Groove	30 mils + 10 mils
Width of 4" Groove	4 ½" ± 1/8"
Width of 6" Groove	6 ½" ± 1/8"
Width of 8" Groove	8 ½" ± 1/8"
Width of 12" Groove	12 ½" ± 1/8"
Width of 24" Groove	24 ½" ± 1/8"
Length of Skip Lines	10'-6" ± 3"
Tapers at ends of lines	6" to 9"
Between Double Lines	4" ± ½"

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(Metric)

Depth of Groove	0.762 mm + 0.25 mm
Width of 100 mm Groove	115 mm ± 3 mm
Width of 150 mm Groove	165 mm ± 3 mm
Width of 200 mm Groove	216 mm ± 3 mm
Width of 300 mm Groove	318 mm ± 3 mm
Width of 600 mm Groove	622 mm ± 3 mm
Length of Skip Lines	3220 mm ± 3 mm
Tapers at ends of lines	150 mm to 225 mm
Between Double Lines	100 mm ± 13 mm

Priming and tape application shall only be performed on dry clean pavement in weather conditions acceptable to the Engineer and according to the pavement marking tape manufacturer recommendations. If the groove is exposed to traffic and weather conditions overnight, the Contractor shall sand blast the groove prior to priming and applying tape.

633.4 METHOD OF MEASUREMENT

- A. **Cold Applied Plastic Pavement Marking:** Pavement marking, of the width and color specified will be measured by the linear foot (0.1 meter).
- B. **Cold Applied Plastic Pavement Marking Arrows:** Pavement marking arrows will be measured by count of each type specified.
- C. **Cold Applied Plastic Pavement Marking Messages:** Pavement marking messages will be measured by count of each complete word specified.
- D. **Cold Applied Plastic Pavement Marking Areas:** Marking areas will be measured to the nearest square foot (0.1 square meter).
- E. **Pavement Marking Paint and Beads:** Paint and beads will be measured to the nearest ½ gallon (1 L) of paint.
- F. **Grooving for Pavement Marking Tape:** Grooving for pavement marking tape installation will be measured to the nearest linear foot (0.1 meter), along the length of the groove for the width of grooving specified in the plans. Grooving for words and messages will be measured by the word. Grooving for arrows will be measured by the each and miscellaneous grooving will be measured to the nearest square foot (0.1 square meters).

633.5 BASIS OF PAYMENT

- A. **Cold Applied Plastic Pavement Marking:** Pavement marking of each width specified, will be paid for at the contract unit price per linear foot (0.1 meter).

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- B. Cold Applied Plastic Pavement Marking Arrows:** Pavement marking arrows of the type specified will be paid for at the contract unit price per each.
- C. Cold Applied Plastic Pavement Marking Messages:** Pavement marking messages will be paid for at the contract unit price per each word.
- D. Cold Applied Plastic Pavement Marking Areas:** Pavement marking areas will be paid for at the contract unit price per square foot (0.1 square meter).
- E. Pavement Marking Paint and Beads:** Paint and beads will be paid for at the contract unit price per gallon (Liter) for each color of pavement marking paint. Payment will be full compensation for furnishing paint and beads and for labor, equipment, and incidentals necessary.
- F. Grooving for Pavement Marking Tape:** Grooving will be paid for at the contract unit price per linear foot (0.1 meter) for the width of groove specified or the contract unit price per word, per arrow, each, or square foot (0.1 square meter) as required by the respective contract item. Payment will be full compensation for equipment, labor, materials, and all incidentals required.