

**SECTION 48 - TRAFFIC STRIPES AND PAVEMENT MARKINGS**  
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## **SECTION 48 TRAFFIC STRIPES AND PAVEMENT MARKINGS**

### **48-1 GENERAL**

Traffic stripes and pavement markings shall be as shown on the Plans and shall conform to these Specifications.

The traffic stripes and pavement markings shall conform to the standards, dimensions, and details as specified in the State of California Traffic Manual.

### **48-2 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS**

Thermoplastic traffic stripes and pavement markings shall conform to Section 84-2, "Thermoplastic Traffic Stripes and Pavement Markings", of the State Specifications, and to these Specifications. Thermoplastic shall be Alkyd type for extrusion application, and shall produce an adherent reflectorized strip capable of resisting deformation by traffic.

The thermoplastic material shall be one hundred percent (100%) solids. The binder shall consist of synthetic alkyd resins, and shall be homogeneously incorporated with all the necessary prime pigments, fillers and glass beads to produce a coating that meets the requirements specified in the following table:

<b>REQUIRED THERMOPLASTIC CHARACTERISTICS</b>		
<b>Requirement</b>	<b>Color</b>	
	<u>White</u>	<u>Yellow</u>
• Glass Beads, AASHTO M-247, Type I, percent by weight, min. (California Test Method 423)	30	30
• Titanium Dioxide (TiO <sub>2</sub> ), percent by weight, min. (AASHTO T250)	10	
• Lead Chromate, Medium Heat Stability, percent by weight, min.		2.5
• Specific Gravity, max. (California Test Method 423)	2.15	2.15
• Binder, percent by weight, min. (California Test Method)	18	18
• Ring & Ball Softening Point, °F (ASTM E28)	200 - 240	200 - 240
<i>Tests on Material after 4 hours heat with stirring at 425°F+ 2°F, which includes 1 hour for meltdown and temperature stabilization:</i>		
• Bond Strength to Concrete, 0.125-inch thick film drawdown at 425°F test at 75°+ 2°F, psi, min. (California Test Method 423)	180	180
• Brookfield Thermosel Viscosity, Spindle SC4-27, 20 RPM at 425°F, Poise (California Test Method 423)	30 - 45	30 - 45
• Impact Resistance, Falling Ball Method, 0.125 inch thick film drawdown at 425°F on concrete. Test at 75+2°F, inch-lbs., (ASTM D2794)	10	10
• Daylight Luminous Reflectance, min. (ASTM E97)	75	40
• Yellowness Index, max., (ASTM E313)	0.15	
• Hardness, Shore A-2 Durometer with 2 kilogram weight at 115°F. (California Test Method 423)	60 - 80	60 - 80
• Low Temperature Stress Cracking, Resistance at 25°F, (AASHTO T250)	No Crack	No Crack
• Color Match, Federal Std. No. 595a, Color No. 33538		Passes

The thermoplastic material shall be applied in a single, uniform layer by extrusion methods.

Stencils shall be used when applying thermoplastic material for pavement markings. Stencils may be new or used if in good condition. If stencils are bent or damaged they shall be replaced.

The pavement surface to which thermoplastic material is applied shall be completely coated by the material and the voids of the pavement surface shall be filled.

Unless otherwise specified in the Special Provisions, the thermoplastic material for traffic stripes shall be applied at a minimum thickness of .075 inch. Thermoplastic material for pavement markings shall be applied at a thickness of 0.125 inch. Glass beads shall be applied immediately to the surface of the molten thermoplastic material at rate of not less than eight (8) pounds per one hundred (100) square feet. The amount of glass beads applied shall be measured by stabbing the glass beads tank with a calibrated rod.

### **48-3 PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS**

Painted traffic stripes and pavement markings shall conform to Section 84-3, "Painted Traffic Stripes and Pavement Markings", of the State Specifications, and to these Specifications.

Self-sticking traffic marking tape, vinyl or otherwise, developed for such use shall be used for temporary striping as required, unless otherwise shown or specified in the Contract.

### **48-4 PREFORMED TRAFFIC STRIPES AND PAVEMENT MARKINGS**

#### **48-4.01 General**

Preformed traffic stripes and pavement markings shall be furnished and placed in accordance with these Specifications and as directed by the Agency. All pavement markings shall be in conformance with the State of California Traffic Manual.

The preformed stripes and pavement markings shall consist of white or yellow film with pigments blended to conform to standard highway marking colors. The pigments shall be thoroughly blended to produce long lasting colors resistant to the effects of weather exposure and to last through the expected life of the film.

The preformed tapes shall consist of a pressure sensitive adhesive that is capable of adhering to clean and dry bituminous or portland cement surfaces. All surfaces shall be prepared and tape applied as indicated by the manufacturer's specifications.

The Contractor shall post-inlay all traffic stripes and markings on new asphalt surfaces in accordance with the manufacturer's recommendations and these Specifications. The Contractor shall post-inlay within twenty-four (24) hours of the placement of an asphalt overlay.

The Contractor shall not apply tape without assistance of a manufacturer's factory service representative, who shall be present during tape application.

The Contractor shall provide manual or automatic application equipment as required. The application equipment shall be capable of simultaneously applying two (2) parallel four-inch (4") lines spaced three-inches (3") apart. The application equipment shall also be capable of applying unlined, pre-coated, pressure-sensitive, adhesive pavement marking tape.

The manual unit shall have a manually actuated product feed advance system and a foot operated product cutting mechanism.

The automatic unit shall have the capability of advancing, applying, and cutting the pavement marking tape at specific pre-programmed lengths, at speeds up to six and one half miles per hour (6.5 mph) when towed by an appropriate vehicle.

Additional supplemental equipment for manual application of required primers, or for manual tamping of the applied markings shall also be provided.

Prior to installation, the Contractor shall submit to the Agency for approval the method the Contractor proposes to use to install traffic stripes and markings, including a list of equipment to be used in the installation.

The completed traffic stripes and markings shall have clean, well-defined edges, without deformations, and be free of tears or other disfigurements. Improperly placed, defective, or disfigured traffic stripes and markings shall, at the Contractor's expense, be immediately removed from the pavement surface by methods approved by the Agency.

Completed traffic stripes shall be uniform, straight on tangent alignment, and on a true arc on curved alignment. On tangent alignment, when a one-hundred-foot (100') string line is stretched taut and placed directly on the outer edge of the completed traffic stripe, the distance between the string and the edge of the traffic stripe shall not exceed three-quarters of an inch (3/4"), measured anywhere along any one hundred-foot (100') interval of the tangent alignment. On curved alignment, the outer edge of the traffic stripe shall not deviate more than three-quarters of an inch (3/4") from the true arc. The lengths of the gaps and individual stripes that form broken traffic

stripes shall not deviate more than two inches (2") from the lengths required to produce a uniformly repeating, broken-stripe pattern.

#### **48-4.02 High Reflective Preformed Traffic Striping**

Preformed striping material shall be durable retroreflective preformed patterned pavement tape (#380) with ceramic beads as manufactured by the 3M Company or equivalent if approved in writing by the Agency.

The preformed tape shall have the following minimum retroreflective values measured in accordance with ASTM Designation: D 4061:

Requirement	Color	
	White	Yellow
Entrance Angle	86.0° - 86.5°	86.0° - 86.5°
Observation Angle	0.2° - 1.0°	0.2° - 1.0°
Specific Luminance [(mcd·ft)·fc]	1,100 - 700	800 - 500

#### **48-4.03 Preformed Traffic Stripes**

Preformed striping material shall be durable retroreflective preformed pavement tape (#5730) with glass beads as manufactured by the 3M Company or equivalent if approved in writing by the Agency.

The preformed tape shall have the following minimum reflective values measured in accordance with ASTM Designation: D 4061:

Requirement	Color	
	White	Yellow
Observation Angle	0.2° - 0.5°	0.2° - 0.5°
Specific Luminance [(mcd·ft)·fc]	550 - 380	410 - 250

#### **48-4.04 Twelve-Inch Preformed Traffic Striping (White and Yellow) and Markings**

Twelve-inch (12") preformed traffic striping (white and yellow) and markings shall be furnished and placed in accordance with these Specifications and as directed by the Agency.

Preformed traffic stripes shall be installed on all newly resurfaced streets.

Preformed striping material shall be durable retroreflective preformed pavement tape (#420) with glass beads as manufactured by the 3M Company or equivalent product as approved by the Agency.

The preformed tape shall have the following minimum reflective values as measured in accordance with ASTM Designation: D 4061:

Requirement	White		
Entrance Angle	86.0°	86.0°	86.5°
Observation Angle	0.2°	0.5°	1.0°
Specific Luminance [(mcd·ft)·fc]	700	500	400

**48-5 PLACEMENT**

New traffic striping of the roadway centerline shall be installed on each segment of roadway construction on the same day that the final lift of asphalt concrete pavement is placed on that roadway segment.

New traffic striping of lane lines, crosswalks, and stop bars (skip white and solid white) shall be installed on each segment of roadway construction within one Calendar Day of the final lift of asphalt concrete pavement placed on that roadway segment.

If application of lane line striping, crosswalks, and/or stop bars is not completed on the required day, the Contractor shall supply and install temporary pavement markings as detailed below:

Temporary pavement markings shall be flush mounted reflectorized tape squares, four inch by four inch (4" x 4") 3M "Staymark" with backing liners, detour grade, #6350 yellow and #6351 white, or approved equal. Right turn barrier lines, edge lines, and shoulder lane lines shall not be delineated with temporary pavement markings. The spacing of the temporary pavement markings shall be as follows:

<u>Line Type</u>	<u>Color</u>	<u>Spacing</u>
Centerline (straight roadway portions)	Yellow	48' O.C.
Centerline (tapered or curving portions)	Yellow	24' O.C.
Stop Lines	White	6' O.C.
Channelizing Line	White	24' O.C.

The Contractor shall remove the temporary pavement markings prior to the installation of new striping.

All other required new striping (e.g. bicycle lane stripes, edge lines, pavement markings, etc., not listed above) shall be installed on each roadway segment within two (2) Working Days of the day the final lift of asphalt concrete pavement is placed on that roadway segment.

**48-6 MEASUREMENT AND PAYMENT**

Thermoplastic traffic stripes will be measured by the linear foot along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. If the Contract includes a separate pay item for two-direction, no passing zone striping, each stripe of the double traffic stripe is measured separately by the linear foot. If the Contract does not have a separate pay item for two-direction, no passing zone striping, a double traffic stripe, consisting of two (2) four-inch (4") wide yellow stripes, will be measured as two (2) traffic stripes. If the Contract includes a separate pay item for median island and/or two-way left turn striping as depicted in Details 28, 29, and 31 of State Plan A20B, each stripe of the quadruple traffic striping shall be measured by the linear foot. If the Contract does not have a separate pay item for median island and/or two-way left turn striping, as depicted in Detail 28, 29 and/or 31 of State Plan A20B, a quadruple traffic stripe consisting of either four (4) solid four-inch (4") yellow stripes or two (2) solid and two (2) skip four-inch (4") wide yellow stripes, will be measured as four (4) traffic stripes. If the Contract includes a separate pay item for channelizing striping, an eight-inch (8") stripe shall be measured by the linear foot. If the Contract does not include a separate pay item for channelizing striping, as depicted in Detail 38 of State Plan A20D, an eight-inch (8") stripe shall be measured as two feet (2') of traffic striping for each linear foot of striping installed. If the Contract includes a separate pay item for bike lane striping, as depicted in Detail 39 or 39A of State Plan A20D, a six-inch (6") stripe shall be measured by the linear foot. If the Contract does not include a separate pay item for bike lane striping, as depicted in Detail 39 or 39A of State Plan A20D, a six-inch (6") stripe

shall be measured as one and one-half feet (1-½') of traffic striping for each linear foot of striping installed.

Thermoplastic pavement markings, including crosswalk lines and stop bars, will be measured by the square foot for the actual area covered. The prices paid per linear foot for thermoplastic traffic stripes of the widths and patterns designated in the Contract and per square foot for thermoplastic pavement markings include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying thermoplastic traffic stripes and pavement markings, complete in place, including establishing alignment for stripes, and layout work, as shown or specified in the Contract, these Specifications, and directed by the Agency.

Painted traffic stripes will be measured by the linear foot along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two (2) four-inch (4") wide yellow stripes separated by a three-inch (3") wide black stripe, will be measured as one (1) traffic stripe. Painted pavement markings will be measured by the square foot for the actual area painted. The prices paid per linear foot for painted traffic stripes and per square foot for painted pavement markings include full compensation for furnishing all labor, materials, tools, equipment, and incidentals involved in painting traffic stripes. Compensation shall include establishing alignment for stripes and layout work as shown or specified in the Contract, these Specifications, and directed by the Agency.

Preformed traffic stripes will be measured by the linear foot along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two (2) four-inch (4") wide yellow stripes, will be measured as two (2) traffic stripes. Undulation striping will be paid for under this item. Preformed pavement markings will be measured by the square foot for the actual area covered. Parking stall brackets shall be considered markings for payment purposes. The prices paid per linear foot for preformed traffic stripes of the widths and patterns designated in the Contract and per square foot for preformed pavement markings include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying preformed traffic stripes and pavement markings, complete in place, including establishing alignment for stripes, and layout work, as shown or specified in the Contract, these Specifications, and directed by the Agency.