

SECTION 6100 - PAVEMENT MARKING (THERMOPLASTIC)**PART 1 - GENERAL**

- 1.01 SCOPE:** This Section covers hot-applied, extruded thermoplastic and cold-applied tape for white and yellow pavement marking. Topics include worker's qualifications; weather limits; material requirements; schedule of sizes, patterns, and uses; surface preparation; application requirements; and acceptance criteria.
- 1.02 REFERENCE STANDARDS:** In this Section, the "Manual on Uniform Traffic Control Devices," U.S. Department of Transportation, Federal Highway Administration, is referred to as "MUTCD".
- 1.03 INSTALLER'S QUALIFICATIONS:** Installation shall be by an installer with at least ten successful installations of pavement marking of similar scope. The ten installations shall include work for at least 3 separate owners in the Kansas City metropolitan area.
- 1.04 ENVIRONMENTAL LIMITATIONS:** Except when directed by Engineer, pavement markings shall not be placed unless the following environmental conditions are met:
- A. Air temperature shall be 55°F and rising.
 - B. Pavement shall be completely free of moisture.
 - C. For cold-applied tape, the pavement temperature shall be at least 70°F.
- 1.05 SUBMITTALS:** The following shall be submitted for review:
- A. Manufacturer's and supplier's test results from an independent testing laboratory demonstrating compliance of hot-applied compound, drop-on beads, and cold-applied tape to the requirements given in Part 2 of this Section. This submittal is not required for those materials listed as approved materials in Part 2.
 - B. Manufacturer's application recommendations.
 - C. References demonstrating installer's qualifications.

PART 2 - PRODUCTS

- 2.01 THERMOPLASTIC MARKING:** Only extrusion type thermoplastic systems with both integral and top dressing glass beads shall be accepted. Prior to the application of drop-on beads, thermoplastic marking compound shall have the following properties:

- A. Chemical composition shall be:

<u>Component</u>	<u>Percent by Weight</u>	
	<u>White</u>	<u>Yellow</u>
Binder	18 min	18 min
Titanium Oxide	10 - 15	---
Lead Chromate	---	4 - 10
Glass Beads	48 min	48 min
Filler	remainder	remainder

Thermoplastic fumes shall be nontoxic at recommended application temperature.

- B. Binder shall be of alkyd type, composed of maleic modified rosin ester and other plasticizers.
- C. Colors: White shall be pure white with reflectance of 75 percent minimum as tested by ASTM E97. Yellow shall match FHWA PR color No. 1 with reflectance of 45 percent minimum as tested by ASTM E97.
- D. Other properties shall be as follows:

<u>Property</u>	<u>Limit</u>	<u>Test Method</u>
Color Retention	No Variance	72-hour exposure per ASTM D795
Water Absorption	0.5% max	ASTM D570
Softening Point	90°C min	ASTM E28
Low Temperature Resistance	No cracks or flaking from substrate	Min 32 sq. in. thermoplastic on concrete substrate; 1 hr cold water immersion; 24 hr deep freeze at -10°C; return to room temperature.
Specific Gravity	1.9 to 2.3	Water Displacement Method
Drying Time	15 minutes at ambient temp of 75°F	Material applied at 400°F, line solid and no effect of tracking.
Indentation Resistance	40 to 75 units after 15 seconds	Shore Durometer, Type A2 per ASTM D2240; at 45°C \pm 2° and a 2 Kg weight
Abrasion Resistance	8 gram loss max	Total loss from four repeats of blasting with 400 g of glass beads at 22 psi
Reheating	thermoplastic held at 425°F for 6 hr shall pass all tests described in this table	

- E. Sealer: Sealer for aged asphalt pavements shall meet thermoplastic manufacturer's recommendations.

2.02 GLASS BEADS:

- A. The following requirements apply to all glass beads used in thermoplastic:
 - 1. Refractive index shall be between 1.50 and 1.60 when tested by the liquid emersion method at 25°C.
 - 2. Roundness: At least 75 percent of glass beads shall be true spheres when tested by ASTM D1155.
 - 3. Gradation of glass beads shall be:

<u>Sieve Size</u>	<u>Percent Passing</u>
No. 20	100
No. 30	75 - 95
No. 50	15 - 35
No. 100	0 - 5

- B. Coatings:
 - 1. Glass beads used in compound shall be coated to promote adhesion to the thermoplastic binder.
 - 2. Glass beads used as top dressing shall be resistant to clumping caused by moisture. Beads used as top dressing shall pass the moisture resistance/free flow, anti-wicking, and adhesion tests.

2.03 COLD-APPLIED MARKINGS: Cold-applied pavement markings shall meet the requirements of KDOT Standard Specifications Subsection 2204, cold plastic pavement marking material. Only materials prequalified by KDOT Bureau of Materials and Research shall be used.

- A. Surface Adhesives: Adhesive for cold-applied markings shall be spray on type for asphalt pavements and contact cement for concrete pavements. Adhesive shall meet cold-applied marking manufacturer's recommendations for the type required.

2.04 TEMPORARY PAVEMENT MARKINGS: Temporary pavement marking tape used for construction traffic control shall meet the requirements of KDOT Standard Specifications Subsection 2205 and shall be completely removed at the completion of the job or phase.

2.05 APPLICATION EQUIPMENT: Application equipment shall be as recommended by the marking manufacturer.

PART 3 - EXECUTION:

3.01 STANDARD SIZES AND PATTERNS: Unless required otherwise in the Special Conditions or drawings, the following sizes, patterns, and materials shall be used:

<u>Use</u>	<u>Color</u>	<u>Type</u>	<u>Size</u>	<u>Pattern</u>
Center Line	Yellow	Hot	Double 4" line with 4" space	Continuous line; break at intersections and intersection type commercial entrances
Lane Line	White	Hot	6" wide	12.5' line, 37.5' skip
Channelizing Line	White	Hot	6" wide	Continuous line
Edge line	Varies	Hot	6" wide	Continuous line; at median islands, painted medians, and rural arterials and collectors
Diagonals	Varies	Hot	18" wide	At 45° clockwise rotation from direction of travel; line spacing in feet = posted speed limit in mph
Stop bars	White	Hot	24"	4' separation from cross walk; otherwise in line with stop sign
Cross walk	White	Hot	12" lines	Line separation normally 6', increase to 8' or 10' in areas of high pedestrian traffic
Cross bars	White	Hot	24" bars with 4' spaces	Cross bars for midblock use; bar length normally 6', increase to 8' or 10' in areas of high pedestrian traffic
Words	White	Cold	8' high	Alphabet style shall conform to MUTCD
Arrows	White	Cold	----	Arrow style shall conform to MUTCD; turn arrow 8' high, through arrow 9.5', turn and through 12.75'

Lines 12" wide or less shall be extruded in one pass. Bars 12" through and including 24" shall be extruded in two passes.

3.02 SURFACE PREPARATION: Pavement shall be dry and free of oil, dirt, and debris at time of application. Asphalt surfaces older than 3 months and all concrete surfaces shall be sand or shot blasted, swept, and air blasted before application of pavement markings. Newly laid asphalt shall be swept and air blasted before application of pavement markings.

3.03 APPLICATION: Application procedures shall follow the marking manufacturer's recommendations. Surface adhesive shall be applied for all cold-applied applications. Sealer shall be applied for thermoplastic applications to concrete surfaces and asphalt surfaces older than 3 months.

Rate of glass bead top dressing of thermoplastic shall be 10 pounds of glass beads for 100 square feet of marking. Beads shall be dispensed uniformly across the section of the molten thermoplastic. Beads shall imbed themselves to approximately 60 percent of their diameter.

3.04 TOLERANCES: Pavement marking be within the following tolerances:

- A. Thickness shall be minimum 90 mils. (Thermoplastic only)
- B. Edges and ends shall not run or bleed more than 1/4-inch in 10 feet. (Thermoplastic only)
- C. Width shall be true to plan \pm 1/4-inch for 4-inch and 6-inch lines, and \pm 1/2-inch for other lines.
- D. Length of stripes skips and bars shall be true to plan \pm 2 inches.
- E. Longitudinal lines shall be at proper location to \pm 2 inches and shall not vary more than 1 inch in 200 feet.

3.05 APPEARANCE STANDARD: At end of guarantee period, markings shall have uniform surface, crisp edges, and clean cut offs; shall exhibit satisfactory retroreflectivity; and shall meet the location tolerances of this Section.

END OF SECTION 6100