DMS - 8220

HOT APPLIED THERMOPLASTIC

EFFECTIVE DATES: SEPTEMBER 2007–APRIL 2009.

8220.1. Description. This Specification governs for the materials, composition, quality, sampling, and testing of thermoplastic and materials utilized in its application to the roadway surface.

8220.2. Units of Measurements. The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

8220.3. Bidders' and Suppliers' Requirements.

A. Procurement by the State. Submit a sample of thermoplastic for evaluation to the Texas Department of Transportation, Construction Division, Materials and Pavements Section (CST/M&P) (CP51), 9500 Lake Creek Parkway, Austin, TX 78717. (This evaluation is to ensure that the manufacturer has the technical and production capabilities to produce a material conforming to the requirements of this Specification.)

B. Contracts. All thermoplastic pavement marking material (TPMM) and other materials, that are utilized in the application of thermoplastic markings, must be manufactured by a company who has previously submitted samples of the material to CST/M&P for evaluation.

8220.4. Payment.

A. Procurement by the State. Payment for all materials governed by this Specification will be in conformance with provisions in the purchase order awarded by the State.

B. Contracts. All materials governed by this Specification utilized by the Contractor in contract projects will be paid for as prescribed in "Item 666, Reflectorized Pavement Markings," of the Department's *Standard Specifications for Construction of Highways, Streets, and Bridges.*

8220.5. Sampling and Testing. The Department will sample and test in accordance with CST/M&P's *Manual of Testing Procedures.* Unless otherwise noted, the Department will samples these materials at the manufacturing site.

Specific tests are normally indicated in conjunction with specific specification requirements. However, the Department reserves the right to conduct whatever tests deemed necessary to identify component materials and verify results of specific tests.

Costs of sampling and testing are normally borne by the Department; however, the costs of sampling and testing of materials failing to conform to these requirements must be borne by the Contractor or supplier.

Costs of sampling and testing of failing material will be assessed at the rate established by the Director of CST/M&P in effect at the time of testing. Amounts due the Department for conducting such tests will be deducted from monthly or final estimates on Contracts or from partial or final payments on direct purchases by the State.

8220.6. Material Requirements. Provide TPMM compounded for traffic markings applied to asphaltic or Portland cement concrete surfaces.

- Clearly mark each bag to indicate color, weight, and lot or batch number. (A lot or batch is each individual mix or blend that produces a finished product ready for use.)
- Each bag must contain 50 lb. of material.
- The bag must be composed of a compatible material to allow for the placement of the bag and its contents into the melter.
- Notify CST/M&P if production lots exceed 4,500 lb.

A. Pigments. When washed free of resins by solvent washing, prime and filler pigments must pass a U.S. Standard Sieve Number 200 (Tex-863-B) and must meet the following specific requirements for each pigment.

- Prime
  - The white pigment must be a rutile titanium dioxide.
  - The yellow pigment must be a heat-resistant, double-encapsulated medium chrome yellow or other approved heat-resistant pigment.
- Filler
  - The filler pigment must be calcium carbonate of 95% purity.

B. Binder. The binder must consist of a mixture of resins, at least one of which is a solid at room temperature, and high boiling point plasticizers. At least 1/3 of the binder composition must be a maleic-modified glyceryl ester of rosin and must be no less than 8% by weight of the entire material formulation.

The infrared analysis of the resin extract must match the spectra on file at CST/M&P in accordance with Tex-888-B.

C. Silica. The total silica used in the formulation must be in the form of glass traffic beads.

D. Glass Traffic Beads. Drop-on beads must meet the requirements of DMS-8290.

The glass traffic beads used in the formulation must meet the following requirements:

- Manufacture
  - Manufactured from glass;
  - Spherical in shape;
  - Essentially free of sharp angular particles;
  - Essentially free of particles showing milkiness, surface score, or surface scratching; and
  - Water-white in color.

- Contaminants
  - Contain less than 1/4 of 1% moisture by weight;
  - Free of trash, dirt, etc.; and
  - Show no evidence of objectionable static electricity when flowing through a regular traffic bead dispenser.
- Gradation
  - Sieve Analysis Tex-831-B.

Table 1

Sieve Analysis, Glass Traffic Beads Gradation Requirements

Openings Micrometers	(U.S. Standard Sieves)	Percent Passing
850	(#20)	100
600	(#30)	80 – 95
300	(#50)	15 – 35
150	(#100)	0 – 4

  - Irregular Particles – Glass traffic beads, retained on any screen used to determine gradation requirements, must not contain more than 30% (by weight) irregular particles measured by Tex-832-B.
- Index of Refraction—Glass traffic beads, when tested by the liquid immersion method at 77°F, must show an index of refraction within the range of 1.50 to 1.53.
- Wetting—Glass traffic beads must be capable of being readily wet with water when tested in accordance with Tex-826-B.
- Stability—Glass traffic beads must show no tendency toward decomposition, surface etching, change in retroreflective characteristics, or change in color after:
  - 1 hr. exposure to concentrated hydrochloric acid at 77°F;
  - 24 hr. exposure to weak alkali; and
  - 100 hr. of weather-o-meter exposure in accordance with ASTM G 155 using Exposure Cycle 1 with a quartz inner filter glass and Type "S" Borosilicate outer filter glass.

8220.7. Finished Product Requirements.

A. Physical Characteristics. Unless otherwise specified, the finished TPMM must be a free flowing granular material. The material must remain in the free flowing state in storage for a minimum of 6 mo. when stored at temperatures of 100°F or less. Produce material that is readily sprayable through nozzles commonly used on thermoplastic spray equipment at temperatures between 400 and 425°F.

B. Toxicity. At temperatures up to and including 446°F, materials must not give off fumes that are toxic or otherwise injurious to persons, animals, or property.

C. Material Stability. The material must not break down or deteriorate when temperatures are held at 400°F for 4 hr.

D. Temperature versus Characteristics. The temperature versus viscosity characteristics of the material in the plastic state must remain constant throughout up to four reheatings to 401°F and from batch-to-batch.

E. Chemical Resistance. Produce material that is unaffected by contact with sodium chloride, calcium chloride, or other similar chemicals on the roadway surface; by contact with the oil content of pavement materials; or by contact from oil droppings from traffic.

F. Softening Point. The materials must not soften at 194°F when tested by the ball and ring method. (ASTM E 28)

G. Color. The CIE chromaticity coordinates of the material, when determined in accordance with Tex-839-B, must fall within an area having the following corner points:

Table 2

CIE Chromaticity Coordinate Corner Points

	1		2		3		4		Brightness
	x	y	x	y	x	y	x	y	Y
White	.290	.315	.310	.295	.350	.340	.330	.360	Min. 65
Yellow	.470	.455	.510	.489	.490	.432	.537	.462	45-60

The white and yellow material must meet the above specified color requirements for each color before and after 70 hr. of weather-o-meter exposure. Weather-o-meter exposure will be in accordance with ASTM G 155 using Exposure Cycle 1 with a quartz inner filter glass and Type "S" Borosilicate outer filter glass.

H. Abrasion. TPMM must have a loss between 4.0 and 12.0 g when tested for abrasion in accordance with Tex-851-B according to Steps 1 through 8 of the procedure using the following test parameters:

- Test Distance—5 in.
- Blast Pressure—40 psi
- Sample Angle—10°
- Blast Media—1200 g.

I. Uniformity. Manufacture material so that, when sampled in accordance with CST/M&P's testing procedures, any 100-g sample will be representative of the batch or lot of material.

8220.8. Formula.

Table 3
TPMM

White	% by Weight	Yellow	% by Weight
Binder	18 – 23	Binder	18 – 23
Titanium Dioxide	12 – 15	Medium Chrome Yellow	5 – 10
Calcium Carbonate	20 – 42	Calcium Carbonate	20 – 42
Glass Traffic Beads	30 – 45	Glass Traffic Beads	30 – 45
Total	**100**	**Total**	**100**

Note: The above requirements will be determined by testing in accordance with Tex-863-B.

8220.9. Archived Versions. Archived versions are available.