

**SPECIFICATION  
PREFORMED THERMOPLASTIC PAVEMENT MARKINGS**

1. **USE:** A durable, retroreflective preformed thermoplastic pavement marking material suitable for use as roadway, intersection, commercial or private pavement delineation and markings.
  - 1.1. The markings must be a resilient white, yellow, or other color thermoplastic product with uniformly distributed glass beads throughout the entire cross sectional area. The markings must be resistant to the detrimental effects of motor fuels, lubricants, hydraulic fluids, antifreeze, etc. Lines, legends and symbols are capable of being affixed to bituminous and/or portland cement concrete pavements by the use of the normal heat of a propane torch. Other colors shall be available as required.
  - 1.2. The markings must be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with the torch.
  - 1.3. The markings shall not have minimum ambient and road temperature requirements for application, storage, or handling.
  
2. **MANUFACTURING LOCATION, CONTROL AND ISO CERTIFICATION:** The marking material must be produced in the United States, and the manufacturer must be ISO 9001:2008 certified for design, development and manufacturing of preformed thermoplastic pavement markings, and provide proof of current certification.
  
3. **MATERIAL:** Must be composed of an ester modified rosin resistant to degradation by motor fuels, lubricants etc. in conjunction with aggregates, pigments, binders and glass beads which have been factory produced as a finished product, and meets the requirements of the current edition of the Manual on Uniform Traffic Control Devices for Streets and Highways. The thermoplastic material conforms to AASHTO designation M249, with the exception of the relevant differences due to the material being supplied in a preformed state.
  - 3.1. Graded Glass Beads:
    - 3.1.1. The material must contain a minimum of thirty percent (30%) intermixed graded glass beads by weight. The intermixed beads shall be conforming to AASHTO designation M247, with minimum 80% true spheres and minimum refractive index of 1.50.
    - 3.1.2. The material must have factory applied coated surface beads in addition to the intermixed beads at a rate of 1 lb. ( $\pm$  10%) per 10 sq. ft. These factory applied coated surface beads shall have a minimum of 80% true spheres, minimum refractive index of 1.50, and meet the following gradation.

Size Gradation		Retained, %	Passing, %
US Mesh	$\mu$ m		
12	1700	0 - 2%	98 - 100%
14	1400	0 - 3.5%	96.5 - 100%
16	1180	2 - 25%	75 - 98%
18	1000	28 - 63%	37 - 72%
20	850	63 - 72%	28 - 37%
30	600	67 - 77%	23 - 33%
50	300	89 - 95%	5 - 11%
80	200	97-100%	0 - 3%

- 3.2. Pigments:
- 3.2.1. White: The material shall be manufactured with sufficient titanium dioxide pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected.
- 3.2.2. Red, Blue, and Yellow: The material shall be manufactured with sufficient pigment to meet FHWA Docket No. FHWA-99-6190 Table 5 and Table 6 as revised and corrected. The yellow pigments must be organic and must be heavy-metal free.
- 3.2.3. Other Colors: The pigments must be heavy-metal free.
- 3.3. Heating indicators: The top surface of the material (same side as the factory applied surface beads) shall have regularly spaced indents. The closing of these indents during application, shall act as a visual cue that the material has reached a molten state allowing for satisfactory adhesion and proper bead embedment, and as a post-application visual cue that the application procedures have been followed.
- 3.4. Skid Resistance: The surface, with properly applied and embedded surface beads, must provide a minimum resistance value of 45 BPN when tested according to ASTM E 303.
- 3.5. Thickness: The material must be supplied at a minimum thickness of 125 mils (3.15 mm).
- 3.6. Versatility: As an option, turn arrows and combination arrows may come without surface applied glass beads, thus facilitating the use of those arrows as either left or right indicators, thereby reducing inventory requirements.
- 3.7. Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline.
- 3.8. Retroreflectivity: The material, when applied in accordance with manufacturer's guidelines, must demonstrate a uniform level of sufficient nighttime retroreflection when tested in accordance to ASTM E 1710. The applied material must have an initial minimum intensity reading of  $500 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$  for white and  $300 \text{ mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$  for yellow as measured with a Delta pavement marking retroreflectometer.

Note: Initial retroreflection is affected by the amount of heat applied during installation. When ambient temperatures are such that greater amounts of heat are required for proper installation, initial retroreflection levels may be affected.

#### 4. APPLICATION:

- 4.1. Asphalt: The materials shall be applied using the propane torch method recommended by the manufacturer. The material must be able to be applied without minimum requirements for ambient and road temperatures and without any preheating of the pavement to a specific temperature. The material must be able to be applied without the use of a thermometer. The pavement shall be clean, dry and free of debris. Supplier must enclose application instructions in English and Spanish with each box/package only pertaining to an application method that does not require preheating of the pavement to a specific temperature before application.
- 4.2. Portland Cement Concrete: The same application procedure shall be used as described under Section 4.1. However, a compatible primer sealer shall be applied before application to assure proper adhesion.
5. **PACKAGING:** The preformed thermoplastic markings shall be placed in protective plastic film with cardboard stiffeners where necessary to prevent damage in transit. Linear material must be cut to a maximum of 3' long pieces. Legends and symbols must also be supplied in flat pieces. The cartons in which packed shall be non-returnable, shall contain a minimum of 35% post-consumer recycled materials, shall not exceed 40" in length and 25" in width, and shall be labeled for ease of identification. The weight of the individual carton must not exceed seventy (70) pounds. A protective film around the box must be applied in order to protect the material from rain or premature aging.
6. **TECHNICAL SERVICES:** The successful bidder shall provide technical services as required. Regionally-located manufacturer's representative, employed directly by the manufacturer, can provide no-cost on-site training for proper application.
7. **PERFORMANCE:** The preformed thermoplastic markings shall meet state specifications and be approved for use by the appropriate state agency.