Special Specification 6373
All-Weather Patterned Thermoplastic Pavement Markings

1. DESCRIPTION

Furnish and install wet-reflective patterned pavement markings, with or without profile, in accordance with this Specification and in conformance with the dimensions and lines shown on the plans or established by the Engineer.

2. MATERIALS

2.1. Thermoplastic Pavement Marking Materials. Furnish thermoplastic pavement marking material meeting the minimum requirements of DMS-8220, “Hot Applied Thermoplastic.”

2.2. Traffic Beads. Furnish a traffic bead system to meet the desired performance requirements of this Specification.

3. EQUIPMENT

3.1. General. Use pavement marking application equipment that:

- is maintained in satisfactory condition,
- meets or exceeds the requirements of the National Board of Fire Underwriters and the Texas Railroad Commission for this application,
- uses an automatic bead dispenser attached to the pavement marking equipment, and
- can provide continuous mixing and agitation of the pavement marking material.

3.2. Material Placement Requirements. Use a mobile, truck-mounted, and self-contained pavement-marking machine capable of:

- providing uniform heating of striping materials to temperatures exceeding 390°F (199°C);
- maintaining the thermoplastic striping material in a plastic state in all mixing and conveying parts, including the line dispensing device, until applied;
- producing varying widths and thickness of thermoplastic traffic stripes;
- producing the types of shapes of profiles and patterned markings specified;
- traveling at a uniform, predetermined speed over variable road grades to produce uniform application of striping material, following straight lines and making normal curves in a true arc; and
- air-blasting the pavement, applying the thermoplastic stripe, and immediately applying the drop-on glass beads in a single pass by double-drop application, such that they appear uniform on the entire traffic stripe and markings.

The applicator for the drop-on glass beads must be capable of delivering a uniform drop rate at variable thermoplastic application speeds and must be equipped with an automatic cutoff control that is synchronized with cutoff of the thermoplastic material.

The melt kettle must be equipped with an automatic temperature control device and thermometer to thermostatically control the temperature and prevent overheating of the thermoplastic material. It must also be equipped with sufficient agitation to prevent settling of the inter-mix beads.
3.3. **Retroreflectometers.**

3.4. **Mobile Retroreflectometer.** Use a mobile retroreflectometer approved by the Materials and Tests Division and certified by the Texas Transportation Institute Mobile Retroreflectometer Certification Program.

3.5. **Portable Retroreflectometer.** Use a portable retroreflectometer that:

- meets the requirements of ASTM E1710 and ASTM E2832,
- has either an internal global positioning system (GPS), or the ability to be linked with an external GPS, with a minimum accuracy rating of 16.4 ft. in accordance with the circular error probability (CEP) method (the radius of the circle with its origin at a known position that encompasses 50% of the readings returned from the GPS instrument); and
- can record and print the GPS location and retroreflectivity reading for each location where readings are taken.

4. **CONSTRUCTION**

Place markings before opening to traffic unless providing for short-term or work-zone markings.

4.1. **General.** Obtain approval for the sequence of work and estimated daily production. On roadways already open to traffic, place markings with minimum interference to the operations of that roadway. Use traffic control as shown on the plans or as approved. Protect all markings placed under open-traffic conditions from traffic damage and disfigurement.

Establish guides to mark the lateral location of pavement markings as shown on the plans or as directed, and have guide locations verified. Use material for guides that will not leave a permanent mark on the roadway.

Apply markings on pavement that is completely dry and meets all temperature and humidity requirements of the manufacturer.

Apply markings:

- using widths, colors, and at locations shown on the plans;
- in a structured pattern of individual drops that forms a minimum marking width from one outer edge to the opposite outer edge meeting the widths shown on the plans;
- in proper alignment with the guides without deviating from the alignment more than 1 in. per 200 ft. of roadway or more than 2 in. maximum;
- with each individual drop free of blisters, holes, or voids and with a minimum size of 0.75 in², a minimum thickness of 175-mil, and a maximum spacing between each drop of one-inch;
- with uniform shape and thickness for each individual drop and with the shape designed to allow water to shed from the marking;
- that form a longitudinal stripe with the appearance of a clean edge when viewed at highway speeds;
- that harden properly with no tackiness;
- using personnel skilled and experienced with installation of pavement markings;
- that are reflectorized; and
- that meet requirements in Tex-828-B.

Remove all applied markings that are not in alignment or sequence as stated in the plans or as stated in the specifications at the Contractor’s expense in accordance with Item 677, “Eliminating Existing Pavement Markings and Markers,” except for the “Measurement” and “Payment” articles.

4.2. **Surface Preparation.** Unless otherwise shown on the plans, prepare surfaces in accordance with this Section.
4.2.1. **Cleaning Asphalt Surfaces Younger Than 3 Yr. and All Retracing.** Air-blast or broom old hydraulic cement concrete surfaces and all asphalt surfaces to remove loose material, unless otherwise shown on the plans.

4.2.2. **Cleaning Asphalt Surfaces Older than 3 Yr. and all Hydraulic Concrete (No Existing Markings).** Clean in accordance with Item 678, "Pavement Surface Preparation for Markings," to remove curing membrane, dirt, grease, loose and flaking existing construction markings, and other forms of contamination.

4.2.3. **Sealer for Type I Markings.** For asphalt surfaces more than 3 yr. old or for concrete, apply a pavement sealer before placing Type I markings on locations that do not have existing markings, unless otherwise approved. The pavemen sealer may be either a Type II marking or an acrylic or epoxy sealer, unless otherwise shown on the plans. Follow the manufacturer's directions for application of acrylic or epoxy sealers. When the sealer becomes dirty after placement, clean by washing or in accordance with Section 4.2.1, "Cleaning Asphalt Surfaces Younger than 3 Yr. and Retracing." Place the sealer in the same configuration and color (unless clear) as the Type I markings, unless otherwise shown on the plans.

4.3. **Application.** Apply markings on surfaces with a minimum surface temperature of 50°F, when measured in accordance with Tex-829-B.

Apply markings during good weather, unless otherwise directed. If markings are placed at Contractor option when inclement weather is impending, and the markings are damaged by subsequent precipitation, the Contractor is responsible for all costs associated with replacing the markings, if required.

4.3.1. **Profile Pavement Markings.** Apply Type I profile markings at a longitudinal spacing indicated on the plans. The markings must be profiled in a vertical manner such that the profile is transverse to the longitudinal marking direction. The profile must not be less than 0.30 in. (300 mil) nor greater than 0.50 in. (500 mil) in height when measured above the normal top surface plane of the roadway. The transverse width of the profile must not be less than 3.25 in., and the longitudinal width not less than 1 in., when measured at the top surface plane of the profile bar. The profile may be either a 1 or 2 transverse bar profile. When the 2 transverse bar profile is used, the spacing between the bases of the profile bars must not exceed 0.50 in. The above transverse bar width is for each 4 in. of line width.

4.4. **Retroreflective Requirements.** Patterned pavement markings must meet the minimum retroreflectivity values in Table 1 for edge line markings, center-line/no passing barrier-line, and lane lines when measured anytime between 3 days but not later than 10 days after application.

<table>
<thead>
<tr>
<th></th>
<th>White (ASTM E1710)</th>
<th>Yellow (ASTM E2832)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>400</td>
<td>325</td>
</tr>
<tr>
<td>Wet continuous</td>
<td>150</td>
<td>125</td>
</tr>
</tbody>
</table>

4.5. **Retroreflectivity Measurements.** Use a mobile retroreflectometer for dry retroreflectivity readings, unless otherwise shown on the plans.

4.5.1. **Mobile Reflectometer Measurements.** Provide mobile measurements averages for every 0.1 mi., unless otherwise specified or approved. Take measurements on each section of roadway for each series of markings (e.g., edge-line, center skip line, each line of a double line) and for each direction of travel. Take all measurements in the direction of traffic flow, except on centerline on 2-way roadways, take measurements in both directions. Furnish measurements in compliance with Special Specification, "Mobile Retroreflectivity Data Collection for Pavement Markings," unless otherwise approved. The Engineer may require an occasional field comparison check with a portable retroreflectometer meeting the requirements listed above to ensure accuracy. Use all equipment in accordance with the manufacturer's recommendations and directions. Inform the Engineer at least 24 hr. in advance of taking any
Portable Reflectometer Measurements. When using a portable reflectometer to measure continuous wetting retroreflec-
tion, take measurements in accordance with ASTM E2832 and Item 666.

Traffic Control. Provide traffic control, as required, when taking retroreflectivity measurements after marking ap-
lication. On low volume roadways (as defined on the plans), refer to the figure entitled “Temporary Road Closure” in Part VI of the Texas Manual on Uniform Traffic Control Devices for the minimum traffic control requirements. For all other roadways, the minimum traffic control requirements will be as shown on the standard plans TCP (3-1) and TCP (3-2). The lead vehicle will not be required on divided highways. The traffic control plan and traffic control devices must meet the requirements listed in Item 502, “Barricades, Signs, and Traffic Handling.” Time restrictions that apply during striping application will also apply during the retroreflectivity inspections except when using the mobile retroreflectometer, unless otherwise shown on the plans or approved.

Performance Period. All markings must meet the requirements of this Specification for at least 30 calendar days after installation. Retroreflective requirements under Section 4.4 are limited to the time window defined in Section 4.4. Unless otherwise directed, remove pavement markings that fail to meet requirements, and replace at the Contractor’s expense. Replace failing markings within 30 days of notification. All replacement markings must also meet all requirements of this Specification for a minimum of 30 calendar days after installation.

MEASUREMENT

This Item will be measured by the foot. Double stripes will be measured separately.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2, “Plans Quantity Measurement.” Additional measurements or calculations will be made if adjustments of quantities are required.

Acrylic sealer, epoxy sealer, or Type II markings, when used as a sealer, will be measured as Pavement Sealer.

PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “All-Weather Patterned Thermoplastic Pavement Markings” of the size, color, shape, and thickness specified, “All-Weather Patterned Thermoplastic with Profile Pavement Markings” of the size, color, shape and thickness specified, or “Pavement Sealer” of the size specified. This price is full compensation for cleaning and preparing the pavement surface, for furnishing and placing all materials, and for all materials, labor, tools, equipment, and incidentals necessary to complete the work.

Surface Preparation, when shown on the plans, will be paid for under Item 678, “Pavement Surface Preparation for Markings.”

Final work-zone pavement markings (Type II), which can be used as a sealer for Type I markings, will be paid for under this Item.