

**Item No. 871S**  
**Reflectorized Pavement Markings**

**871S.1 Description**

This item shall govern furnishing and placement of reflectorized pavement markings of the colors, types, shapes, sizes, widths and thickness indicated on the Drawings.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses. \* See modifications for more information

**871S.2 Materials**

A. Type I Marking Material.

Type I markings are thermoplastic type materials that require heating to elevated temperatures for application. Type I marking materials shall conform to TxDOT Departmental Materials Specification Item DMS-8220, "Thermoplastic Pavement Markings". Each container of Type I Marking Material shall be clearly marked to indicate the color, weight (mass), type of material, manufacturer's name and lot/batch number.

B. Type II Marking Material.

Type II markings are paint- type materials that are applied at ambient temperature or slightly elevated temperatures. Type II marking materials shall conform to Specification Item No. 860S, "Pavement Marking Paint".

C. Source of Supply.

All Type I marking materials shall be purchased on the open market. All glass traffic beads shall be purchased on the open market.

**871S.3 Equipment Requirements**

The equipment used to place pavement markings shall:

- (1) be maintained in satisfactory operating condition;
- (2) be considered in satisfactory operating condition if it has an average placement rate of 5,000 lineal feet (1 525 lineal meters) per hour of acceptable four (4) inch {100 millimeters} solid or broken lines over any five (5) consecutive working days;
- (3) meet or exceed the material handling at elevated temperature requirements of the National Fire Underwriters and the Texas Railroad Commission;
- (4) be capable of placing a minimum of 40,000 lineal feet (12 190 lineal meters) of 4 inch {100 millimeters} solid or broken markings per day;
- (5) have production capabilities similar to four-inch (100 mm) marking equipment and shall be capable of placing linear markings up to 8 inches {200 millimeters} in width in a single pass when used for placing markings in widths other than 4 inches {100 millimeters};
- (6) have production capabilities considered satisfactory by the Engineer or designated representative, when used to place markings other than solid or broken lines;

- (7) be capable of placing a centerline and no-passing barrier-line configuration consisting of one broken line with two solid lines at the same time to the alignment and spacing shown on the Drawings;
- (8) be capable of placing broken and/or continuous white line from both sides;
- (9) be capable of placing lines with clean edges and of uniform cross-section. All lines shall have a tolerance of plus or minus 1/8 inch per 4-inch width {3 mm per 100-mm width};
- (10) have an automatic cut-off device with manual operating capabilities to provide clean, reasonably square marking ends to the satisfaction of the Engineer, and to provide a method of applying broken line in an approximate stripe-to-gap ratio of 10 to 30. The length of the stripe shall not be less than 10 feet (3.05 meters) or more than 10.5 feet (3.2 meters). The total length of any stripe-gap cycle shall not be less than 39.5 feet (12 meters) or more than 40.5 feet (12.3 meters);
- (11) provide continuous mixing and agitation of the pavement marking material. The use of pans, aprons or similar appliances, which the die overruns, will not be permitted for longitudinal striping applications;
- (12) apply beads by an automatic bead dispenser attached to the pavement marking equipment in such a manner that the beads re-dispensed uniformly and almost instantly upon the marking as the marking is being applied to the road surface. The bead dispenser shall have an automatic cut-off control, synchronized with the cut-off of the pavement marking equipment.

#### **871S.4 Construction Methods**

##### **A. General.**

When required by the Engineer, the Contractor and the Engineer shall review the sequence of Work to be followed and the estimated progress schedule.

Markings may be placed on streets either free of traffic or open to traffic. On streets already open to traffic, the markings shall be placed under traffic conditions that exist with a minimum of interference to the operation of the facility. Traffic control shall be as shown on the Drawings or as approved in writing by the Engineer or designated representative. All markings placed under open-traffic conditions shall be protected from traffic damage and disfigurement. On streets open to traffic with 3 lanes of travel in one direction, all markings shall be placed from the outside lanes only, unless otherwise approved in writing by the Engineer or designated representative.

Guides to mark the lateral location of pavement markings shall be established as shown on the Drawings or as directed by the Engineer or designated representative. The Contractor shall establish the pavement marking guide and the Engineer or designated representative will verify the location of the guides.

Markings shall be placed in proper alignment with the guides. The deviation rate in alignment shall not exceed 1 inch per 200 feet {25 mm per 60 meters} of street. The maximum deviation shall not exceed 2 inches {50 millimeters} nor shall any deviation be abrupt.

Markings shall essentially have a uniform cross-section. The density and quality of markings shall be uniform throughout their thickness. The applied markings shall have no more than five (5) percent, by area, of holes or voids and shall be free of blisters.

Markings, in place on the street, shall be reflectorized both internally and externally. Glass beads shall be applied to the materials at a uniform rate sufficient to achieve uniform and distinctive retroreflective characteristics when observed in accordance with TxDOT Test Method Tex-828-B.

Contractor personnel shall be sufficiently skilled in the Work of installing pavement markings.

Markings placed that are not in alignment or sequence, as shown on the drawings or as stated in the Standard Specification Item, shall be removed by the Contractor at its own expense. Removal shall be in accordance with Specification Item 874S, "Eliminating Existing Pavement Markings and Markers", except for measurement and payment. Guides placed on the street for alignment purposes shall not establish a permanent marking on the street.

~~Unless indicated otherwise on the Drawings, pavement markings shall not be placed sooner than 3 calendar days after the placement of a new hot mix asphaltic concrete surface course or surface treatment.~~

Unless otherwise shown on the Drawings, pavement markings may be applied by any method that will yield markings meeting the requirements of the Specification Item.

\* See modifications for more information

#### B. Surface Preparation

New Portland cement concrete surfaces shall be cleaned in accordance with Specification Item 875S, "Pavement Surface Preparation for Markings" to remove curing membrane, dirt, grease, loose and/or flaking existing construction markings and other forms of contamination.

Older Portland cement concrete surfaces and asphaltic surfaces that exhibit loose and/or flaking existing markings shall be cleaned in accordance with Specification Item 875S, "Pavement Surface Preparation for Markings" to remove all loose and flaking markings.

Pavement to which material is to be applied shall be completely dry. Pavements shall be considered dry if, on a sunny day after observation for 15 minutes, no condensation occurs in the underside of a 1 foot {300 mm} square piece of clear plastic that has been placed on the pavement and weighted on the edges.

#### C. Application of Type I Markings.

New Portland cement concrete surfaces shall be further prepared for Type I markings, after cleaning, by placing a Type II marking as a sealer in accordance with the Specification Item. When placing Type I markings in new locations on asphaltic surfaces 3 years old or older or any Portland cement concrete surfaces, a Type II marking shall be used as a sealer. Unless otherwise shown on the Drawings, existing Portland cement concrete and asphaltic surfaces to be restriped will not require Type II markings as a sealer; existing markings may be used as a sealer in lieu of Type II markings. ~~Type II markings shall be placed a minimum of 2 and a maximum of 30 calendar days in advance of placing Type I markings.~~ Type II markings which become dirty due to inclement weather or street conditions shall be cleaned by washing, brushing, compressed air or other means approved by the Engineer, prior to application of Type I markings. If washing is used, the surface of Type II markings shall become thoroughly dry before placing Type I

markings. Color, location and configuration of Type II markings shall be the same as that of Type I markings.

Type I pavement marking material shall be applied within temperature limits recommended by the material manufacturer. Application of Type I pavement markings shall be done only on clean, dry pavement having a surface temperature above 50°F (10°C). Pavement temperature shall be measured in accordance with TxDOT Test Method Tex-829-B.

When Type I pavement marking application is by spray, and operations cease for 5 minutes or more, the spray head shall be flushed by spraying pavement marking material into a pan or similar container until the pavement marking material being sprayed is at the proper temperature for application.

Unless otherwise directed by the Engineer in writing, Type I pavement-marking materials shall not be placed on streets between September 30 and March 1, subject to temperature and moisture limitations specified herein.

Unless otherwise shown on the Drawings, the minimum thickness of Type I marking shall be 0.060 inches (60 mil) {1.5 millimeters} for edgeline markings and 0.090 inches (90 mil) {2.3 millimeters} for stop-bars, legends, symbols, gore and center-line/no-passing barrier-line markings, when measured in accordance with TxDOT Test Method Tex-854-B. The maximum thickness of all Type I markings shall be 0.180 inches (180 mil) {4.6 millimeters}.

The thickness of Type I markings at the time of placement will be measured above the plane formed by the pavement surface. The Contractor will supply an approved device to measure the thickness of the applied markings. The markings shall be of uniform thickness throughout their lengths and widths.

\* See modifications for more information

#### D. Application of Type II Markings

The application of Type II marking materials shall be done only on surfaces with a minimum surface temperature of 50°F (10°C). \* See modifications for more information

The application rate for Type II marking material shall be between 15 and 20 gallons per mile (35 to 47 liters per kilometer) of solid 4 inch {100 millimeter} line and between 30 and 40 gallons per mile (70 to 95 liters per kilometer) of solid 8 inch {200 millimeter} line. For new surface treatment projects the application rate shall be between 25 and 30 gallons per mile (60 to 70 liters per kilometer) of solid four (4) inch line {one hundred (100) millimeters} and between 40 and 50 gallons per mile (95 to 120 liters per kilometer) of solid 8 inch {200 millimeters} line.

Pavement markings for new surface treatment projects shall be applied in two applications, each approximately one-half the application rate. The first application shall not contain glass beads. The interval between the first and second application shall be a minimum of 1 hour.

When there is impending inclement weather and the Contractor chooses to apply water-based traffic paint and the markings, that are subsequently damaged by rain, sleet, hail, etc., the Contractor is responsible for all costs associated with the replacement markings. The Contractor will be paid, when the work is acceptable.

### 871S.5 Performance Period for Type I Markings.

Type I pavement markings shall meet all the requirements of this technical specification for a minimum of 15 calendar days after installation. Pavement markings that fail to meet all requirements of this specification shall be removed and replaced by the Contractor at its own expense. The Contractor shall replace all pavement markings failing the requirements of this technical specification within 30 calendar days following notification by the Engineer or designated representative of such failing. All replacement markings shall also meet all requirements of this technical specification for a minimum of 15 calendar days after installation.

### 871S.6 Measurement

This Specification Item will be measured by the lineal foot (lineal meter), by each of the various words, shapes or symbols, or by any other unit as shown on the Drawings.

Where double stripes are placed, each stripe will be measured separately.

Type II pavement markings requiring 2 applications on new surface treatments (Specification Item No. 320S) will be measured as 1 marking.

Type II pavement marking materials, when used as a sealer for Type I markings will be measured as Type II markings.

Final work zone pavement markings (paint and beads), which will be used as a sealer for Type I pavement markings, will not be measured for payment.

### 871S.7 Payment

The work performed and materials furnished in accordance with this Standard Specification Item and measured as provided under "Measurement" will be paid for at the Unit bid price for "Reflectorized Pavement Markings" of the various types, colors, shapes, sizes, widths and thickness (Type I markings only) specified. This price shall include full compensation for furnishing all materials; for application of pavement markings; and for all other labor, tools, equipment and incidentals necessary to complete the Work, except as described below.

Surface Preparation, when indicated on the Drawings, will be paid for under Specification Item 875S, "Pavement Surface Preparation for Markings."

Final work zone pavement markings (paint and beads), which will be used as a sealer for Type I pavement markings, shall be included in the unit price bid for the item of construction for which final work zone pavement markings are used.

When replacement Type II markings are required due to damage to the original markings from rain, sleet, hail, etc., and the original markings were placed at the Direction of the Engineer, the Contractor will be paid for the actual quantity of original and replacement markings at the unit bid price for the bid item.

Payment will be made under one or more of the following:

#### Original placement of Reflectorized Pavement Markings:

**Pay Item 871S-A:** Reflectorized Type I Thermoplastic Pavement Markings  
\_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color per lineal foot.

**Pay Item 871S-B:** Reflectorized Type I Thermoplastic Pavement Markings  
\_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color **Words**  
per each.

- Pay Item 871S-C:** Reflectorized Type I Thermoplastic Pavement Markings  
 \_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color **Shapes**  
 per each.
- Pay Item 871S-D:** Reflectorized Type I Thermoplastic Pavement Markings  
 \_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color **Symbols**  
 per each.
- Pay Item 871S-E:** Reflectorized Type II Paint Pavement Markings  
 \_\_\_ inches in width, \_\_\_ in color per lineal foot.
- Pay Item 871S-F:** Reflectorized Type II Paint Pavement Markings  
 \_\_\_ inches in width, \_\_\_ in color **Words**  
 per each.
- Pay Item 871S-G:** Reflectorized Type II Paint Pavement Markings  
 \_\_\_ inches in width, \_\_\_ in color **Shapes**  
 per each.
- Pay Item 871S-H:** Reflectorized II Paint Pavement Markings  
 \_\_\_ inches in width, \_\_\_ in color **Symbols**  
 per each.

Replacement of Reflectorized Pavement Markings:

- Pay Item 871S-AR:** Replace Reflectorized Type I Thermoplastic Pavement Markings  
 \_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color per lineal foot.
- Pay Item 871S-BR:** Replace Reflectorized Type I Thermoplastic Pavement Markings **Words**  
 \_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color per each.
- Pay Item 871S-CR:** Replace Reflectorized Type I Thermoplastic Pavement Markings **Shapes**  
 \_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color per each.
- Pay Item 871S-DR:** Replace Reflectorized Type I Thermoplastic Pavement Markings **Symbols**  
 \_\_\_ inches in width, \_\_\_ mils in thickness \_\_\_ in color per each.
- Pay Item 871S-ER:** Replace Reflectorized Type II Paint Pavement Markings  
 \_\_\_ inches in width, \_\_\_ in color per lineal foot.
- Pay Item 871S-FR:** Replace Reflectorized Type II Paint Pavement Markings **Words**  
 \_\_\_ inches in width, \_\_\_ in color per each.
- Pay Item 871S-GR:** Replace Reflectorized Type II Paint Pavement Markings **Shapes**  
 \_\_\_ inches in width, \_\_\_ in color per each.
- Pay Item 871S-HR:** Replace Reflectorized Type II Paint Pavement Markings **Symbols**  
 \_\_\_ inches in width, \_\_\_ in color per each.

END

<b><i>SPECIFIC CROSS REFERENCE MATERIALS</i></b>	
Specification Item No. 871S, "Reflectorized Pavement Markings"	

City of Austin Contract Documents

<u>Designation</u>	<u>Description</u>
Section 00300U	Bid Form (Unit Price)

City of Austin Standard Specifications

<u>Designation</u>	<u>Description</u>
Item No. 320S	Two Course Surface Treatment
Item No. 860S	Pavement Marking Paint (Reflectorized)
Item No. 874S	Eliminating Existing Pavement Markings and Markers
Item No. 875S	Pavement Surface Preparation For Markings

Texas Department of Transportation: Manual of Testing Procedures

<u>Designation</u>	<u>Description</u>
Tex-828-B	Determining Functional Characteristics of Pavement Markings

Tex-829-B Method For Measuring Pavement Temperature  
 Tex-854-B Evaluation Of Thermoplastic Striping For Uniformity And Thickness

<b><i>RELATED</i></b> CROSS REFERENCE MATERIALS
Specification Item No. 871S, "Reflectorized Pavement Markings"

City of Austin Standard Specifications

<u>Designation</u>	<u>Description</u>
Item No. 301S	Asphalts, Oils and Emulsions
Item No. 302S	Aggregates for Surface Treatments
Item No. 310S	Emulsified Asphalt Treatment
Item No. 311S	Emulsified Asphalt Repaving
Item No. 312S	Seal Coat
Item No. 313S	Rubber Asphalt Joint and Crack Sealant
Item No. 315S	Milling Asphaltic Concrete Paving
Item No. 340S	Hot Mix Asphaltic Concrete Pavement
Item No. 341S	Paving Fabric
Item No. 350S	Heating, Scarifying and Repaving
Item No. 360	Concrete Pavement
Item No. 801S	Construction Detours
Item No. 803S	Barricades, Signs and Traffic Handling
Item No. 863S	Reflectorized Pavement Markers
Item No. 864S	Abbreviated Pavement Markings
Item No. 865S	Nonreflectorized Traffic Buttons
Item No. 866S	Jiggle Bar Tile
Item No. 867S	Epoxy Adhesive
Item No. 870S	Work Zone Pavement Markings
Item No. 872S	Prefabricated Pavement Markings
Item No. 873S	Raised Pavement Markers
Item No. 863S-1	Pavement Buttons (Reflectorized-Type I & Type II)
Item No. 865S-1	Traffic Buttons (Non-Reflectorized)

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

<u>Designation</u>	<u>Description</u>
Item No. 302	Aggregates for Surface Treatments
Item No. 314	Emulsified Asphalt Treatment
Item No. 315	Emulsified Asphalt Seal
Item No. 316	Surface Treatments
Item No. 334	Hot Mix-Cold Laid Asphaltic Concrete Pavement

<b><i>RELATED</i></b> CROSS REFERENCE MATERIALS
Specification Item No. 871S, "Reflectorized Pavement Markings"

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

<u>Designation</u>	<u>Description</u>
Item No. 340	Hot Mix Asphaltic Concrete Pavement
Item No. 342	Plant Mix Seal
Item No. 351	Repairing Existing Flexible Pavement Structure
Item No. 354	Planing and/or Texturing Pavement
Item No. 358	Asphaltic Concrete Surface Rehabilitation
Item No. 360	Concrete Pavement
Item No. 421	Hydraulic Cement Concrete
Item No. 427	Surface Finishes for Concrete
Item No. 428	Concrete Surface Treatment

Item No. 662	Work Zone Pavement Markings
Item No. 666	Reflectorized Pavement Markings
Item No. 667	Prefabricated Pavement Markings
Item No. 672	Raised Pavement Markers
Item No. 677	Eliminating Existing Pavement Markings and Markers
Item No. 678	Pavement Surface Preparation For Markings

Texas Department of Transportation: Manual of Testing Procedures

<u>Designation</u>	<u>Description</u>
Tex 729-I	Sampling of Traffic Markers

Texas Department of Transportation: Departmental Materials Specifications

<u>Designation</u>	<u>Description</u>
DM S-4100	Jiggle Bar Tile
DMS-4200	Pavement Markers (Reflectorized)
DMS-4300	Traffic Buttons
DMS-4210	Pavement Markers
DMS-6130	Bituminous Adhesive
DMS-8200	Pavement Paint
DMS-8220	Thermoplastic marking material
DMS-8240	Prefabricated Marking Materials
DMS-8241	Removable Tape
DMS-8290	Pavement Paint
YPT-10 and/or WPT-10	Pavement Paint