

Item No. **860S**  
**Pavement Marking Paint**

**860S.1 Description**

This item shall govern the installation of reflectorized paint pavement marking. The width of the line shall be 4 inches (100 millimeters) and the color as 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.

**860S.2 Submittals**

The submittal requirements of this specification item include:

- A. Proposed paint color(s), brand names, raw materials and products for traffic paint.
- B. Sampling and testing procedures and specific test results for pigment, calcium carbonate, acrylic resins and other materials used in the traffic paints.
- C. Proposed shipping requirements including container type(s) (drums and/or buckets), and labeling.
- D. Manufacturer's recommendations for mixing, storage and application of the traffic glass beads and traffic paint.
- E. All applicable Materials Safety data Sheets for the traffic paint.

**860S.3 Materials**

A. Traffic Stripe Reflective Glass Traffic Beads

- 1. The glass spheres shall not contain more than 30 percent (by weight {mass}) irregular shaped particles when tested in accordance with TxDOT Test Method-832-B. The no. 20 (850  $\mu$ m) sieve shall have a maximum of 35% by weight (mass) allowed irregular particles, based on a visual inspection.

Unless noted otherwise on the Drawings or designated in writing by the Engineer or designated representative, the application rate of the glass traffic beads shall not be less than 6 pounds per gallon (0.7 kilograms per liter). Glass traffic beads shall be essentially free of sharp angular particles and particles showing milkiness or surface scarring or scratching. Glass traffic beads shall be water white in color.

- 2. The glass traffic beads shall meet the following graduation requirements when tested in accordance with TxDOT Test Method Tex-831-B:

US Sieve	SI Sieve	% weight (mass) retained
# 20	(850 $\mu$ m)	3 to 10
# 30	(600 $\mu$ m)	20 to 40
# 40	(425 $\mu$ m)	30 to 50
# 50	(300 $\mu$ m)	15 to 35
# 80	(180 $\mu$ m)	0 to 10

- 3. Index of Refraction: The glass traffic beads, when tested by the liquid immersion method at 77<sup>0</sup>F (25<sup>0</sup>C), shall show an index of refraction within the range of 1.50 to 1.53.

4. Wetting: The glass traffic beads shall be capable of being readily wet with water, when tested according to TxDOT Test Method Tex-826-B.
5. Stability: The glass traffic beads shall show no tendency toward decomposition, surface etching, change in retroreflective characteristics or change in color after
  - (a) One-hour exposure to concentrated hydrochloric acid at 77°F (25°C),
  - (b) 24 hours exposure to weak acids, weak alkali, and
  - (c) 100 hours of weather-o-meter (Atlas, Sunshine Type) exposure, ASTM G-23, Method 1, Type EH.
6. Contaminants: Glass traffic beads shall:
  - (a) contain less than 1/4 of 1 percent moisture by weight (mass).
  - (b) free of trash, dirt, etc.
  - (c) show no evidence of objectionable static electricity when flowing through a regular traffic bead dispenser.
7. Sampling and Testing (TxDOT Test Method Tex-801-B) shall be in accordance with the latest applicable procedures included in the TxDOT Manual on Testing. Applicable test methods include but are not limited to the following:
  - Tex 806-B, "Method for Determining Grind and Oversize Pigment Particles"
  - Tex-810-B, "Test Method for Color and Color Stability of Opaque Colored Pigments"
  - Tex-811-B, "Skinning Characteristics of Coatings"
  - Tex-822-B, "Method for Determining Refractive Index of Glass Beads"
  - Tex-826-B, "Water Absorption Test of Beads"
  - Tex-828-B, "Determining Functional Characteristics of Pavement Markings"
  - Tex-830-B, "Method for Sampling Traffic Stripe Beads"
  - Tex-831-B, "Method for Determining The Gradation of Glass Traffic-Stripe Beads"
  - Tex-832-B, "Methods for Determining the Roundness of Glass Spheres"

## B. Pavement Marking Paint

### 1. Functional Requirements

- (a) All paint-type materials that are applied at ambient or slightly elevated temperatures shall conform to TxDOT Departmental Materials Specifications DMS-8200, YPT 10 and/or WPT-10 and DMS-8290.
- (b) The paint shall be homogenous, well ground to a uniform and smooth consistency and shall not skin nor settle badly nor cake, liver, thicken, curdle or gel in the container.
- (c) The paint, when applied to a bituminous pavement surface under normal field conditions at the required rate of .015 inch (0.4 mm) wet film thickness, shall have a maximum "no pickup" drying time of 15 minutes to prevent displacement or discoloration under traffic.
- (d) In preparation of the paint, the pigments shall be dispersed in the vehicle by appropriate methods so that a fineness reading of not less than 4 is obtained with a Hegman grind gauge.

- (e) Consistency viscosity, measured with a Krebs-Modified-Stormer Viscometer at 77°F (25°C), shall be from 80-90 K.U (with water deleted).
- (f) A thin film of paint spread on a glass plate and allowed to dry thoroughly shall not darken or show any discoloration when subjected to ultraviolet rays for a period of 5 minutes.

2. Material Requirements

(a) Raw Materials

- (1) The exact brands and types of raw materials used in the wet standards are listed for the purpose of facilitating the selection of parallel materials that are equal, not only in quality and composition but also in physical and chemical behavior after aging in the finished product.
- (2) After proposed brand names and types of raw materials by the City of Austin, no substitution will be allowed during the manufacture without prior agreement with the City.
- (3) It shall be the responsibility of the Contractor to utilize materials that not only meet the individual raw material specification, but that also produce a coating that meets the specific formula requirements.
- (4) All materials required to meet TxDOT, Federal and ASTM specifications must meet the latest specification as indicated on the Drawings in effect on the date of the proposal or invitation to bid.

(b) Pigments

(1) Titanium Dioxide:

Titanium Dioxide shall meet ASTM D-476, Type II requirements.

(2) Yellow Pigment:

Yellow Pigment CI 65 (Reddish Yellow)	
Characteristic	Values
Specific Gravity	1.74 to 1.76
Oil Absorption	20 to 30 %
Moisture	0.5 % maximum
Pigment retained on #325 (45 µm) sieve	0.1 % maximum
C.I. Number	11740
Heat Stability	266°F (130°C)

In addition to the requirements identified above, evidence shall be provided that the infrared spectrum matches the standard spectrum on file with TxDOT's Construction Division, Materials Section (CSTM)

- (3) Calcium Carbonate: Calcium Carbonate shall conform to ASTM D-1199, Type GC, Grade I, with a minimum of 95% CaCO<sub>3</sub> and Type PC, with a minimum of 98% CaCO<sub>3</sub>.

- (c) Acrylic Traffic Resins: The acrylic traffic resin shall be similar and equal to the standard sample submitted by the manufacturer. The resin shall be approved prior to the contract award for the proposed use of the pavement paint.

Acrylic Traffic Emulsion

Characteristic	Values
Solids Content	49.5 to 50.5
Viscosity, #2 Spindle, 60 rpm, 77°F (25°C), cps	250 maximum
pH	10.0 to 10.6
Film appearance, 3 mil (75 µm) dry	Smooth, clear, continuous

In addition to the requirements identified above, evidence shall be provided that the infrared spectrum matches the standard spectrum on file with TxDot's Construction Division, Materials Section (CSTM)

(d) Miscellaneous Materials: These materials shall be similar and equal to the standard sample submitted by the vendor. The specific materials shall be approved prior to the contract award for the proposed use of the pavement paint.

- 1) Dispersant
  - Byk 156
  - Tamol 850
  - Colloids 226/35
- 2) Surfactant
  - Triton X-405
  - Colloids CA-407
- 3) Defoamer
  - Foamaster 111
  - Drew 493
  - Colloids 654
- 4) Hydroxy Ethyl Cellulose
  - Natrosol 250 HBR
  - Bermocoll E431FQ
  - Cellosize QP - 30,000
- 5) Coalescent
  - Texanol
  - Exxate 1200
- 6) Preservative
  - Troysan
  - Dowicil 75
  - Nuosept 101
- 7) Methyl Alcohol
  - ASTM D-1152, 1.3320 maximum

(e) Standard Formulae:

The following tables represent the Standard Formulae to be followed by the manufacturer when manufacturing paint to be used by the Contractor on City of Austin paint striping contracts.

Formula: White Traffic Paint

WPT-11 - LEAD FREE WHITE TRAFFIC PAINT		
Component	Pounds	Kilograms
Acrylic Emulsion, 50% Solids, Fastrack 2706	540.	245.
Coalescent, Texanol	20.	9.1
Titanium Dioxide, Rutile, Type II, Tiona RCL-9	100.	45.4
Calcium Carbonate, Type PC, Mississippi M-60	150.	68.
Calcium Carbonate, Type GC, Hubercarb M-4	440.	199.6
Hydroxy Ethyl Cellulose, Natrosol 250 HBR (*)	0.5	0.2
Defoamer, Foamaster 111	5.	2.3
Dispersant, Colloids 226/35	9.	4.1
Surfactant, Triton X-405	2.	0.9
Methyl Alcohol	30.	13.6
Preservative, Troysan 192	2.	0.9
Water, Potable (**)	18.**	8.1**
<b>TOTALS</b>	<b>1316.5</b>	<b>597.2</b>

(\*) The Hydroxy Ethyl Cellulose amount may be varied up to two (2) pounds [0.9 kilograms].

(\*\*) Only 10 pounds (4.5 kilograms) shall be used in the actual manufacture of the pavement paint. The remaining 8 pounds (3.6 kilograms) shall be used as a drum float.

Formula: Yellow Traffic Paint

YPT-11 - LEAD FREE YELLOW TRAFFIC PAINT		
Component	Pounds	Kilograms
Acrylic Emulsion, 50% Solids, Fastrack 2706	540	245.
Coalescent, Texanol	20	9.1
C.I. Pigment Yellow 65, Sunglow Yellow 1244	30.	13.6
Titanium Dioxide, Rutile, Type II, Tiona RCL-9(***)	20.	9.1
Calcium Carbonate, Type PC, Mississippi M-60	150	68.
Calcium Carbonate, Type GC, Hubercarb M-4	450	204.1
Hydroxy Ethyl Cellulose, Natrosol 250 HBR (*)	0.5	0.2
Defoamer, Foamaster 111	5.	2.3
Dispersant, Colloids 226/35	9.	4.1
Surfactant, Triton X-405	2.	0.9
Methyl Alcohol	30.	13.6
Preservative, Troysan 192	2.	0.9
Water, Potable (**)	18.**	8.1**
<b>TOTALS</b>	<b>1276.5</b>	<b>579.0</b>

Additional Criteria for Pavement Paint

Item	Requirements
Grind Particles:	4 minimum, 8 maximum (TxDoT Test Method Tex-806-B)
Gallon Weight:	± 0.10 lbs. of theoretical gallon weight

(Liter mass:)	(± 0.012 kilograms of theoretical liter mass)
Consistency:	80 to 90 K.U.
PH:	a minimum of 9.6
Skimming:	No skinning within 48 hours (TxDoT Test Method Tex-811-B)

- (\*) The Hydroxy Ethyl Cellulose amount may be varied up to two (2) pounds [0.9 kilograms]
- (\*\*) Only 10 pounds (4.5 kilograms) shall be used in the actual manufacture of the pavement paint. The remaining 8 pounds (3.6 kilograms) shall be used as a drum float.
- (\*\*\*) Titanium Dioxide, Rutile, Special, Hilox will be allowed as a substitute in the YPT-11 formula only.

(f) Container and Marking

- 1) Shipment: Shipment shall be made in suitable, strong, well-sealed containers that meet this specification, State of Texas, and federal requirements and are sufficiently sturdy to withstand normal shipping and handling.
- 2) Drum Package Requirements. The paint shall be provided in a new, serviceable, non-leaking, 55 gallon (209 liter) lined, steel drum meeting all applicable federal regulations. Drums are to be non-returnable with full removable heads, three (3) rolling hoops and 12 gauge locking rings with 5/8 inch (15.9 millimeter) locking nut bolt. The nominal metal thickness is to be 0.044 inch (1.1 mm). Each drum is to be equipped with a natural sponge-rubber cord, high-density gasket. The rubber shall be approximately 0.4375 inch (10.9 mm) thick. The gasket, when compressed, shall produce an airtight closure when the drum is sealed.  
  
 When a locking nut is used on drum rings, the locking nut shall be in a non-locking position while tightening the ring. After the ring is tight, the locking nut shall be secured in the locking position.  
  
 A seal shall be affixed to each drum in a manner that the contents of the drum cannot be adulterated without destroying the seal.
- 3) Bucket Packaging Requirements: Paint is to be furnished in new 5 gallon (19 liter) lined, 24 gauge steel, non-leaking buckets.
- 4) Filling Instructions: The paint drums will be filled at 54.5 gallons (206.4 liters) by weight (mass) with a water float of 0.53 gallons (2.0 liters).  
  
 The paint buckets will be filled at 4.95 gallons (18.75 liters) by weight (mass) with a water float of 0.05 gallons (0.18 liters).
- 5) Labeling: Finished paint product containers and cases shall be plainly and securely labeled with:
  - a) City of Austin
  - b) Name and designation of the product,
  - c) Requisition number,
  - d) Batch number,
  - e) Manufacturing date,
  - f) Gross weight, and
  - g) Manufacturer's name.

Labeling shall be prominently displayed on the sides of containers and cases and must be moisture resistant to withstand outdoor storage for a minimum of one year. When the finished product is palletized for

shipment, the labels shall be displayed on the outside fore easy identification. Once the finished product has been labeled properly, the label shall not be modified or changed in any manner without specific approval from the City of Austin. (Note: The material manufacturer shall supply a Materials Safety Data Sheet to comply with OSHA's "Hazard Communication Standard 29 CFR § 1910.1200").

#### **860S.4 Construction Methods**

The Contractor shall use a crew, that is experienced in the work of installing pavement markings and in the necessary traffic control for such operations on the roadway surface, and shall supply all the equipment, personnel, traffic control and materials necessary for the placement of the pavement markings as indicated on the Drawings or directed by the Engineer or designated representative. All work shall conform to the current edition of the Texas Manual of Uniform Traffic Control Devices (TMUTCD), The City of Austin Transportation Criteria Manual, Standard Details 804S-3C and 804S-3D, and this standard specification item.

The pavement surface to receive the pavement markings shall be thoroughly cleaned of all dirt, organic growth or other material that will prevent adhesion of the paint to the roadway surface.

The pavement markings shall be placed in the proper alignment with guides established on the roadway. Deviation from the alignment established shall not exceed 2 inches (50 millimeters) and in addition, the deviation in alignment of the markings being placed shall not exceed 1 inch per 200 feet (25 millimeters per 30 meters) of roadway nor shall any deviation be abrupt.

When deemed necessary by the Engineer or designated representative, the Contractor, at the Contractor's expense, shall place any additional pilot markings required to facilitate the placement of the permanent markings in the alignment specified. Any and all additional markings placed on the roadway for alignment purposes shall be temporary in nature and shall not establish a permanent marking on the roadway.

Materials used for pilot markings and equipment used to place such markings shall be approved by the Engineer or designated representative.

Paint markings on the roadway that are not in alignment or sequence as indicated shall be totally and completely removed by any effective method approved by the Engineer or designated representative, except that grinding will not be permitted.

Paint shall be applied at a rate of not less than 15 gallons nor more than 20 gallons per mile of solid 4 inch stripe (not less than 35 liters nor more than 45 liters per kilometer of solid 100-mm stripe). Application rate for solid 8-inch (200-mm) stripe shall be between 30 and 40 gallons per mile (between 70 and 90 liters per kilometer). (These rates yield wet film thickness from 15 to 20 mils [ 0.4 to 0.5 mm].)

Beads shall be applied to the paint markings at a uniform rate sufficient to achieve the retroreflective characteristics specified when observed conforming to TxDoT Test Method Tex-828-B. All markings placed shall have uniform and distinctive retroreflective characteristics.

Applied markings shall be protected from traffic until they have dried sufficiently so as not to be damaged or tracked by normal traffic movements.

### **860S.5 Equipment**

Paint striping equipment used to place 4 inch (100 mm) solid or broken lines shall have the capability of placing a minimum of 60,000 linear feet (18 300 lineal meters) of marking per working day. Equipment used for placing markings in widths other than 4 inches (100 mm) shall have capabilities similar to 4 inch (100 mm) marking equipment and shall be capable of placing linear markings up to 8 inches (200 mm) in width in 1 pass.

The equipment shall be maintained in satisfactory operating condition. The equipment shall be equipped so that one 4-inch (100-mm) broken line and either 1 or 2 solid lines can be placed at the same time in alignment and spacing as indicated on the drawings. Four inch (100 mm) marking equipment will be considered as unsatisfactorily maintained if it fails to attain an average hourly placement rate of 7000 linear feet (2 100 linear meters) in any 5 consecutive working days of 7 hours or more.

The equipment shall be equipped with an automatic cutoff device (with manual operating capabilities) to provide clean, square marking ends and to provide a method of applying broken line in a stripe to gap ratio of 15 to 25. The length of the stripe shall not be less than 15 feet nor longer than 15.5 feet (less than 4.5 meters nor longer than 4.7 meters). The total length of the stripe-gap cycle shall not be less than 39.5 feet nor longer than 40.5 feet (less than 12 meters nor longer than 12.3 meters) in variance from one cycle to the next nor shall the average total length of a cycle for a road mile (1.6 kilometer) of broken line exceed 40.5 feet or be less than 39.5 feet (exceed 12.3 meters or be less than 12 meters).

The equipment shall be capable of placing lines of all widths with clean edges and of uniform cross section. Four-inch (100-mm) lines shall be 4 inches (100 mm) plus or minus 1/8 inch (3 mm). Eight inch (200 mm) lines shall be 8 inches (200 mm) minimum and 8 1/4 inches (210 mm) maximum in width.

The equipment shall be equipped with an outrigger or outriggers as required to place edge-lines as called for in the plans.

The equipment shall be equipped with traffic glass bead dispensers, 1 for each paint spray gun, placed on the equipment so that beads are applied to the paint almost instantly as the marking is being placed on the roadway surface. The traffic glass bead dispensers shall be designed and aligned so that the beads are applied uniformly to the entire surface of the marking. The traffic glass bead dispensers shall be equipped with automatic cutoff controls, synchronized with the cutoff of the marking equipment. Paint pots or tanks shall be equipped with an agitator that will keep the paint thoroughly mixed and may be either a pressurized or non-pressurized type.

### **860S.6 Measurement**

Work for Pavement Marking Paint lines will be measured by the lineal foot (lineal meter: 1 meter equals 3.28 feet) of the various widths. Work for pavement marking, paint letter or figures will be measured by the square foot (square meter: 1 square meter equals 10.76 square feet).

### **860S.7 Payment**

Work performed as prescribed by this item, measured as provided under "Measurement", shall be paid for at the unit bid price for "Pavement Marking Paint" per lineal foot or square foot of the various widths specified. This price shall include full compensation for furnishing



all labor, tools, equipment, materials and incidentals necessary to complete the work specified.

Payment will be made under one of the following:

- Pay Item No. 860S-A:** Pavement Marking Paint, \_\_\_\_ In. Per Lineal Foot.
- Pay Item No. 860S-B:** Pavement Marking Paint Per Square Foot.
- Pay Item No. 860S-C:** Pavement Marking Paint (Reflectorized), \_\_In. Per Lineal Foot.
- Pay Item No. 860S-D:** Pavement Marking Paint (Reflectorized) Per Square Foot.

End

<b><i>SPECIFIC</i> CROSS REFERENCE MATERIALS</b>
Specification Item 860S "Pavement Marking Paint (Reflectorized)"

Texas Department of Transportation: Manual of Testing Procedures

<u>Designation</u>	<u>Description</u>
Tex 801-B	Testing Coatings and Related Materials
Tex 806-B	Method for Determining Grind and Oversize Pigment Particles
Tex-810-B	Test Method for Color and Color Stability of Opaque Colored Pigments
Tex-811-B	Skinning Characteristics of Coatings
Tex-822-B	Method for Determining Refractive Index of Glass Beads
Tex-826-B	Water Absorption Test of Beads
Tex-828-B	Determining Functional Characteristics of Pavement Markings
Tex-830-B	Method for Sampling Traffic Stripe Beads
Tex-831-B	Method for Determining The Gradation of Glass Traffic-Stripe Beads
Tex-832-B	Methods for Determining the Roundness of Glass Spheres

Texas Department of Transportation: Departmental Materials Specifications

<u>Designation</u>	<u>Description</u>
DMS-8200	Pavement Paint
YPT-11 and/or WPT-11	Pavement Paint

American Society for Testing and Materials (ASTM)

<u>Designation</u>	<u>Description</u>
D 476	Specification for Titanium Dioxide Pigments
D 1152	Specification for Methanol (Methyl Alcohol) with Refractive Index
D 1199	Specification for Calcium Carbonate Pigments
G-23	Recommended Practice for Operating Light-and- Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials

Federal Specifications - OSHA 29 CFR

<u>Designation</u>	<u>Description</u>
§ 1910.1200	Hazard Communication Standard."

City of Austin Standard Details

<u>Designation</u>	<u>Description</u>
804S-3C	Parking Stalls, Crosswalk, and Stop Bars
804S-3D	General Notes

City of Austin Transportation Criteria Manual

<u>Designation</u>	<u>Description</u>
Section 8	Traffic Control

<b><i>SPECIFIC</i> CROSS REFERENCE MATERIALS</b>
Specification Item 860S "Pavement Marking Paint (Reflectorized)"

State of Texas Manual on Uniform Traffic Control Devices for Streets and Highways

<u>Designation</u>	<u>Description</u>
Part III	Markings
Part VI	Traffic Controls for Street and Highway Construction, Maintenance,
860S 0509/26/12	

Utility and Incident Management Operations  
Part VI, Article D Markings  
Part VI, Article F Control of Traffic Through Work Areas

<b><u>RELATED</u> CROSS REFERENCE MATERIALS</b>
Specification Item 860S "Pavement Marking Paint (Reflectorized)"

City of Austin Standard Specifications

<u>Designation</u>	<u>Description</u>
Item No. 863S	Reflectorized Pavement Markers
Item No. 864S	Abbreviated Pavement Markings
Item No. 865S	Non-Reflectorized Traffic Buttons
Item No. 866S	Jiggle Bar Tile
Item No. 867S	Epoxy Adhesive
Item No. 870S	Work Zone Pavement Markings
Item No. 871S	Reflectorized Pavement Markings
Item No. 872S	Prefabricated Pavement Markings
Item No. 873S	Raised Pavement Markers
Item No. 874S	Eliminating Existing Pavement Markings and Markers
Item No. 875S	Pavement Surface Preparation For Markings

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

<u>Designation</u>	<u>Description</u>
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-829-B	Method For Measuring Pavement Temperature

American Society for Testing and Materials (ASTM)

<u>Designation</u>	<u>Description</u>
D-235	Specification for Mineral Spirits
D-362	Specification for Industrial Grade Toluene
D-600	Specification for Liquid Paint Driers
D-605	Specification for Magnesium Silicate Pigment (Talc)
D-740	Specification for Methyl Ethyl Ketone
D-1210	Test Method For Fineness Of Dispersion Of Pigment-Vehicle Systems