

ALABAMA DEPARTMENT OF TRANSPORTATION

DATE: April 21, 2016

Special Provision No. 12-1597(2)

EFFECTIVE DATE: June 1, 2016

SUBJECT: Preformed Traffic Control Markings.

Alabama Standard Specifications, 2012 Edition, SECTION 703 and SECTION 856 shall be revised as follows:

SECTION 703 TRAFFIC CONTROL MARKINGS AND LEGENDS

703.01 Description.

This Section shall cover the work of placing permanent or temporary traffic control markings and legends at the locations shown on the plans or where directed by the Engineer. **Preformed thermoplastic markings may be used for permanent striping, and for other circumstances as designated by the Engineer.** This Section shall also cover the removal of existing or temporary traffic control markings and legends.

703.02 Materials.

(a) General.

Materials shall be furnished in accordance with the requirements given in Sections 856 and 857. The required dimensions, color, type of material and reflectivity will be shown on the plans.

The required type of material will be designated by "Class" and "Type" in accordance with the requirements given Section 701

Class 1H, Class 2, and Class 2T materials shall be in compliance with the formulations given in the tables in Section 856 for each class.

Class 1, Class 3, Class W, **Preformed Traffic Markings**, and Drop On Glass Beads shall be one of the materials shown on List V-3, Temporary Traffic Marking Materials, and List V-4, Permanent Traffic Marking Materials. These lists are in the Department's Manual, "Materials, Sources, and Devices with Special Acceptance Requirements". Information concerning these lists is given in Subarticle 106.01(f) and ALDOT-355.

Preformed traffic markings and legends shall also meet the requirements given in Article 856.09. All preformed traffic markings and legends shall meet the dimensions as shown in the plans and shall meet the tolerance requirements given in Item 703.03(c)1.

703.03 Construction Requirements.

(a) Acceptance Program for Traffic Marking Materials.

The guidelines for the evaluation and acceptance of traffic marking materials are given in the procedure ALDOT-420 "Acceptance Program for Traffic Marking Materials". These guidelines shall be followed in the furnishing and placement of traffic markings and legends.

(b) Temporary Traffic Markings and Legends.

Temporary traffic control markings and legends shall be furnished and placed in accordance with all of the requirements given in Section 701 for Temporary Traffic Stripe except for the placement tolerances for length and width. The length of the markings and legends shall be no greater than 2 inches {50 mm} over or 1 inch {25 mm} under the required length. The width of the markings and legends shall be no greater than 1/2 of an inch {12 mm} over or 1/2 of an inch {12 mm} under the required width.

(c) Permanent Traffic Markings and Legends.

1. Applicator Applied Traffic Markings and Legends.

Permanent traffic control markings and legends shall be furnished and placed in accordance with all of the requirements given in Section 701 for permanent traffic stripe except for the following:

- Any type of equipment may be used that produces acceptable results.
- Class 2 thermoplastic shall be placed to produce a minimum uniform thickness of 0.125 inches {3.0 mm}.
- The length of the markings and legends shall be no greater than 2 inches {50 mm} over or 1 inch {25 mm} under the required length.
- The width of the markings and legends shall be no greater than 1/2 of an inch {12 mm} over or 1/2 of an inch {12 mm} under the required width
- Beads may be hand placed.

2. Preformed Traffic Markings and Legends.

a. General

All preformed traffic markings and legends shall be applied in accordance with the manufacturer's recommendations. Preformed thermoplastic may be applied to asphalt and concrete surfaces. Asphalt pavement shall be allowed to cure for a period of 14 calendar days before the application of the thermoplastic. Concrete pavement shall be allowed to cure for a period of 30 calendar days before the application of the thermoplastic. All preformed traffic markings and legends shall be a minimum uniform thickness of 0.125 inches {3.0mm}.

b. Surface Preparation Prior to the Application of Preformed Thermoplastic.

Areas to be striped shall be thoroughly cleaned of all dirt, oil and other debris in a way that will not damage the pavement surface.

Curing compound on concrete surfaces shall be removed by grinding, wire brushing, sand blasting or other effective means.

Striping shall not begin until the Engineer has inspected the pavement surface and has informed the Contractor that striping may begin.

c. Weather Conditions For The Application Of Preformed Thermoplastic.

Preformed thermoplastic shall not be placed during rain or mist or if the pavement surface is wet. All preformed thermoplastic markings and legends shall be placed per the manufacturer's recommended directions. The Engineer shall be furnished a copy of these recommendations for installation inspection purposes.

d. Composition Of Preformed Thermoplastic.

The preformed thermoplastic shall consist of high quality materials, pigments and glass beads or other reflective material uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres or other reflective material embedded in the top surface.

3. Specialty Traffic Markings and Legends.

Specialty Traffic Markings and Legends shall be placed where indicated on the plans and in accordance with the Special Drawings or plan details. Specialty Traffic Markings and Legends shall meet all of the requirements given in Subarticle 703.02(a) and Item 703.03(c)2.

(d) Retroreflectivity of Traffic Markings and Legends.

The white and yellow pavement markings shall attain an initial retroreflectance of not less than 250 mcd/lx·m². All pedestrian crosswalks, bike lane symbols and messages in a proposed bike lane shall attain initial retroreflectivity of not less than 250 mcd/lx·m².

The Engineer will measure the retroreflectivity of emplaced preform thermoplastic material for each color at 5 random locations throughout the project selected in accordance with the requirements given in ALDOT Procedure 210.

If the average of the 5 retroreflectivity measurements is 85 % of the target retroreflectivity, or greater, the stripe will be accepted without a price adjustment for retroreflectivity.

If the average of the 5 retroreflectivity measurements is less than 85 % and greater than 50 % of the target retroreflectivity, the stripe will be paid for at a percentage equal to the percentage determined from the measurements. For example, if the average of the measurements is 65 % of the target retroreflectivity, payment for the stripe will be 65 % of the contract unit price.

If the average of the 5 retroreflectivity measurements is 50 % of the target retroreflectivity, or less, the stripe shall be removed and replaced without extra compensation.

Any portion of the stripe of the stripe that is determined by the Engineer to be noticeably inconsistent with the overall striping and measures less than 50 % of the target retroreflectivity shall be removed and replaced without extra compensation.

Retroreflectivity measurements will be made in accordance with the requirements given in ALDOT-422 with the exception of the sampling frequency. Measurements will be made between 7 and 30 calendar days after the completion of the placement of all stripe.

(e) Removing Markings or Legends.

The removal of traffic markings and legends shall be done in accordance with the requirements given in Section 701.

703.04 Method of Measurement.

The area of Traffic Control Markings or Legends (Items 703-A, 703-B, 703-H, and 703-I) complete in place and accepted will be the sum of the areas shown on the plans for each marking and legend constructed within the required placement tolerance.

The Removal of Traffic Control Markings or Legends (Item 703-C) shall be measured in the same manner as prescribed above except that it shall cover only the area from which the markings were actually removed.

The area of Temporary Traffic Control Markings or Legends, (Items 703-D and 703-E) complete in place and accepted, will be the sum of the areas shown on the plans for each marking and legend constructed within the required placement tolerance. No measurement for payment will be made for the removal of temporary markings or legends, the removal of such being classified as incidental to the Items of Temporary Traffic Control Markings and Temporary Traffic Control Legends.

703.05 Basis of Payment.

(a) Unit Price Coverage.

The accepted square feet {square meters} of Traffic Control Markings or Legends, Items 703-A, 703-B, 703-H, and 703-I, measured as provided above, will be paid for at the contract unit price bid which shall be full compensation for the item complete in place and includes the cleaning of the pavement, furnishing and applying the markings or legends, and for all materials, equipment, tools, labor and incidentals necessary to complete the work.

The accepted square feet {square meters} of Traffic Control Markings or Legends Removed, Item 703-C, measured as provided above, will be paid for at the contract unit price bid which shall be full compensation for the item complete in place and includes traffic control for removal, all necessary materials, equipment, tools, labor and incidentals necessary to complete the work.

The accepted square feet {square meters} of Temporary Traffic Control Markings or Legends, Items 703-D and 703-E, measured as noted above, will be paid for at the contract unit price bid which shall be full compensation for the item complete in place and includes the cleaning of the pavement, furnishing and applying the markings or legends, traffic control for placing, and for all materials, equipment, tools, labor and incidentals necessary to complete the work.

(b) Payment will be made under Item No.:

703-A Traffic Control Markings, Class _____, Type _____ - per square foot {square meter}

703-B Traffic Control Legends, Class _____, Type _____ - per square foot {square meter}

703-C Removal of Traffic Control Markings or Legends - per square foot {square meter}

703-D Temporary Traffic Control Markings - per square foot {square meter}

703-E Temporary Traffic Control Legends - per square foot {square meter}

703-H Specialty Traffic Control Markings - per square foot {square meter}

703-I Specialty Traffic Control Legends - per square foot {square meter}

SECTION 856 TRAFFIC MARKING MATERIALS

856.01 Acceptance Program for Traffic Marking Materials.

The guidelines for the evaluation and acceptance of traffic marking materials are given in the procedure ALDOT-420 "Acceptance Program for Traffic Marking Materials". These guidelines shall be followed in furnishing traffic marking materials.

856.02 Packaging and Labeling of Containers.

Traffic marking materials shall be shipped in containers that are plainly marked with the weight in pounds per gallon {kilograms per liter}, the volume in gallons {liters}, the color, user information, date of manufacture, lot and batch number. Each batch shall have a unique number. A statement of the percentage composition of the pigment, the proportion of pigment to vehicle, and the name and address of the manufacturer shall also be shown. The label shall contain any instructions for special handling or precautions for use of the material that are recommended by the manufacturer. Containers with inadequate identification and marking will not be accepted for use.

The date of manufacture and the shelf life shall be shown for materials that have a shelf life.

Preformed thermoplastic materials and permanent tape products shall be marked with content, color, date of manufacture and lot number.

856.03 Color and Luminance Factor

The materials for pavement stripe, markings and legends shall meet the performance requirements given in ASTM D 6628 as tested in accordance with the requirements given in ASTM E 1349 with the instrument set to read x, y and Y coordinates with 45 degree/0 degree by-directional geometry, observer angle 2 degrees, and illuminant D65 with the exception of the following:

The initial daytime chromaticity for yellow materials shall fall within the box created by the following coordinates:

Initial Daytime Chromaticity Coordinates (Corner Points)				
	1	2	3	4
X	0.498	0.557	0.479	0.438
Y	0.412	0.442	0.520	0.412

The initial daytime chromaticity for white materials shall fall within the box created by the following coordinates:

Initial Daytime Chromaticity Coordinates (Corner Points)				
	1	2	3	4
X	0.330	0.368	0.340	0.274
Y	0.300	0.366	0.393	0.329

White and yellow materials shall meet the following luminance factor requirements:

White: Daylight luminance factor at 45 degrees/0 degrees - 50 % minimum;

Yellow: Daylight luminance factor at 45 degrees/0 degrees - 35 % minimum.

856.04 Environmental Requirements.

All yellow materials using lead chromate pigments shall meet the criteria of non-hazardous waste as defined by 40 CFR 261.24 when tested in accordance with EPA Method 1311, Toxicity Characteristics Leaching Procedures (TCLP). The striping and marking material, upon preparation and installation, shall not exude fumes which are toxic, or detrimental to persons or property. All material using lead free pigments shall NOT contain either lead or other Resource Conservation and Recovery Act (RCRA) materials, in excess of the standard defined by EPA Method 3050 and 6010.

856.05 Glass Beads.

Glass Beads shall meet the requirements given in AASHTO M 247 and shall not contain greater than 200 ppm (total) for arsenic, 200 ppm (total) for antimony, and 200 ppm (total) for lead when tested according to US EPA Method 3052 and 6010. The manufacturer shall provide independent certified test results that the glass beads meet these requirements. Type 1, 3 and 4 glass beads used for drop on beads shall be coated with a bead coating that is compatible with the traffic marking material to which the glass beads will be applied and will provide adequate moisture proofing, increased adhesion, and optimum embedment of the glass beads. Beads used in the intermix (premixed with paint, thermoplastic or other striping materials) are not required to be coated.

Glass beads shall meet the gradations shown in the following table.

GRADATIONS OF GLASS BEADS, % PASSING DESIGNATED SIEVE						
Sieve Size *	Type of Gradation					
	Type 1	Type 3	Type 4	3M "Reflective Elements" S series	50 % Type 1 and 50 % Type 3 Intermixed	50 % Type 1, 37.5 % Type 3 and 12.5 % 3M "Reflective Elements" Intermixed
10			100	100		100
12		100	95 - 100	85 - 100	100	
14		95 - 100	80 - 95	70 - 96	95 - 100	95-100
16	100	80 - 95	10 - 40	50 - 90	85 - 100	85-100
18		10 - 40	0 - 5	5 - 60	55 - 75	50-75
20	95 - 100	0 - 5	0 - 2	0 - 25	40 - 60	45-55
25		0 - 2			40 - 60	
30	75 - 95			0 - 7	35 - 55	35-50
40						
50	15 - 35				5 - 25	5-20
80						
100	0 - 5				0 - 5	0-5

* Sieve analysis in accordance with the requirements given in ASTM D 1214

856.06 Class 1 Paint.

Class 1 paint shall be one of the materials shown on List V-4, Permanent Traffic Marking Materials. List V-4 is in the Department's Manual, "Materials, Sources and Devices with Special Acceptance Requirements". Manufacturers of Class 1 paint shall participate in ALDOT-420, "Acceptance Program for Traffic Marking Materials".

856.07 Class 1H High Build Paint.

Class 1H paint shall not be used after the expiration of the shelf life. The paint shall be easily stirred and mixed to a uniform consistency prior to use.

Manufacturers of Class 1H paint shall participate in ALDOT-420, "Acceptance Program for Traffic Marking Materials".

Class 1H High Build Paint shall meet the following requirements.

PHYSICAL AND PERFORMANCE REQUIREMENTS FOR HIGH BUILD TRAFFIC PAINT		
PROPERTY	VALUE	TEST METHOD
Acrylic Resin	100 % Rohm & Haas Rhoplex Fastrack HD-21A emulsion with 48.5 - 49.5 % solids content, or Dow DT 400NA acrylic emulsion with 49.5 - 51.5 % solids content, or an approved equal.	ASTM D 2743 Infrared Spectral Analysis
Nonvolatiles in Vehicle	42 % Minimum by Weight	ASTM D 215
No Track Time	Maximum of 10 minutes	ASTM D 711
Volatile Organic Content	Maximum of 1.25 Pounds per Gallon	ASTM D 3960
Pigment Content	Minimum of 55% by Weight Maximum of 62% by Weight	ASTM D 3723
Total Solids Content	Minimum of 73 % by Weight Maximum of 79 % by Weight	ASTM D 2369
White Pigment Content, Rutile Titanium Dioxide	Minimum of 1.0 Pound per Gallon	ASTM D 476
Yellow Pigment Content, Hansa Yellow (11-2400)	% minimum per manufacturer	-
Viscosity @ 77°F (25°C) Kreb Units	78 - 95	ASTM D 562
Density in Pounds per Gallon	White - 13.7 Minimum Yellow - 13.1 Minimum	ASTM D 1475
Scrub Resistance	Pass Minimum 300 cycles	ASTM D-2486
PH	9.6 Minimum	ASTM E 70
Daylight Reflectance %	White - 80 Minimum Yellow - 50 Minimum	ASTM E 1349

856.08 Class 2 and Class 2T Spray Applied Thermoplastic.

Thermoplastic shall be alkyd based materials. Manufacturers of Class 2 and Class 2T Thermoplastic shall participate in ALDOT-420, "Acceptance Program for Traffic Marking Materials".

Reflective glass beads shall be mixed into the thermoplastic as a part of the manufacturing process. The intermixed glass beads shall be either 50 % Type 1 and 50 % Type 3 beads or 50% Type 1, 37.5 % Type 3, and 12.5 % 3M "Reflective Elements". The pigment, glass beads and filler shall be well dispersed in the resin. The composition of Class 2 and Class 2T thermoplastic material shall be in accordance with the following.

COMPOSITION OF CLASS 2 and CLASS 2T THERMOPLASTIC (% BY WEIGHT)				
COMPOSITION	VALUE FOR WHITE	VALUE FOR YELLOW (Lead Free)	VALUE FOR YELLOW (Leaded)	TEST METHOD
Binder	20.0 % minimum	20.0 % minimum	20.0 % minimum	AASHTO T 250
White Pigment TiO ₂ , Type II Rutile	10.0 % minimum	-	1.5 % minimum	ASTM D 476
Glass Beads (Intermixed)	40.0 % minimum	40.0 % minimum	40.0 % minimum	AASHTO T 250
Yellow Pigment, Lead Chromate	-	N/A	5.0 % minimum *	AASHTO T 250
Yellow Pigment, Organic Pigment Yellow 83	-	% minimum per manufacturer **	N/A	-
Calcium Carbonate and Inert Filler (-200 mesh {-75 μm} sieve)	30.0 % maximum	37.5 % maximum	33.5 % maximum	ASTM D 1199
* Note: For yellow leaded thermoplastic markings the pigment shall be silica encapsulated lead chromate yellow, containing a minimum of 42 % lead.				
** Note: For yellow lead free markings the pigment shall be an organic pigment yellow 83. The lead free yellow thermoplastic material shall contain no more than 100 ppm of lead, cadmium, or hexavalent chromium.				

The physical requirements for the thermoplastic shall be in accordance with the following.

PHYSICAL REQUIREMENTS OF CLASS 2 and CLASS 2T THERMOPLASTIC (% BY WEIGHT)			
PROPERTY	MAXIMUM	MINIMUM	TEST METHOD
Water Absorption	0.5 %	-	ASTM D 570
Softening Point	-	195 °F {90 °C}	ASTM D 36
Low Temperature Stress Resistance	-	Pass	AASHTO T 250
Specific Gravity	2.3	1.9	ASTM D 792
Indentation Resistance	75	40	ASTM D 2240* Shore Durometer, A2
Impact Resistance	-	1.0 N·m	ASTM D 256, Method A
Flash Point	-	475 °F {245 °C}	ASTM D 92
*The durometer and panel shall be at 110 °F {45°C} with a 4.4 lb {2.0 kg} load applied. Instrument measurement shall be taken after 15 seconds.			

856.09 Preformed Thermoplastic

Preformed Thermoplastic shall be alkyd based materials. Manufacturers of Class 2 Preformed Thermoplastic shall participate in ALDOT-420, "Acceptance Program for Traffic Marking Materials".

Preformed Thermoplastic shall conform to all physical and composition requirements of Class 2 and 2T Thermoplastic with the exception that preformed Thermoplastic shall contain 30% intermix glass beads.