OKLAHOMA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS
FOR
TRAFFIC STRIPE (PLASTIC)

These Special Provisions revise, amend, and where in conflict, supersede applicable sections of the 2009 Standard Specifications for Highway Construction, English and Metric.

855.01 DESCRIPTION *(Add the following:)*

This work consists of providing and placing alkyd based reflectorized plastic pavement markings on asphalt concrete and Portland cement concrete pavement surfaces.

855.02 MATERIALS *(Add the following:)*

A. General

When using the alkyd based thermoplastic, the manufacturer has the option of formulating the material according to his own specifications. However, the requirements specified herein and in Section 711 of the Standard Specifications apply regardless of the type of formulation used.

Provide resin in which the pigment, glass beads, and filler are well dispersed. Ensure the material is free of skins, dirt, and foreign objects.

Table 855:0A
Composition

Component	Test Method	White [1]	Yellow [1]
Binder		20% min	20% min
TiO2, Type II Rutile	ASTM D476	10% min	-
Glass Beads	AASHTO T 250	40% min	40% min
Yellow Pigment		-	% min per Manufacturer
Calcium Carbonate and Inert Filler (-200 mesh sieve)		30% max	37.5% max

[1] Percentages are by weight.

Provide alkyd/maleic binder consisting of a mixture of synthetic resins (at least one synthetic resin must be solid at room temperature) and high boiling point plasticizers. At least one-half of the binder composition must be 100% maleic-modified glycerol of rosin, and be no less than 15% by weight of the entire material formulation.

B. Lead-Free Yellow Thermoplastic Traffic Stripe

(1) General

Provide plastic marking materials for traffic markings applied to asphaltic or Portland cement in accordance with Section 711, "Traffic Stripe".

Clearly mark each bag to indicate color, weight, pigment type (for yellow only), and lot or batch number. (A lot or batch number is each individual mix or blend that produces a finished product ready for use.)

Ensure each bag contains 50 lbs of material.

(a) Pigments

Provide lead-free yellow and filler pigments that pass a U.S. Standard Sieve Number 200 when washed free of resins by solvent washing.

(b) Prime

Provide yellow pigment that is heat resistant and weather-stable. Ensure the yellow pigment is lead-free, organic yellow pigment (C. I. Pigment Yellow 83, opaque version). Do not mix pigment types within a batch. Obtain the Engineer's approval of alternate pigments other than those listed prior to use in the formulation.

(c) Filler

Provide filler pigment that is calcium carbonate of 95% purity.

(d) Binder

Provide binder consisting of a mixture of resins, at least one of which is a solid at room temperature, and high boiling point plasticizers. At least 1/3 of the binder composition must be a hydrocarbon resin, and must be no less than 8% by weight of the entire material formulation.

(e) Silica

The total silica used in the formulation must be in the form of glass traffic beads.

(f) Glass Traffic Beads

Provide glass traffic beads used in the formulation meeting the requirements for AASHTO M 247 Type I.

(2) Finished Product Requirements

(a) Physical Characteristics

Unless otherwise specified, the finished thermoplastic pavement marking materials must be a free flowing granular material. The material must remain in the free flowing state in storage for a minimum of six (6) months when stored at temperatures of 100 °F or less. Produce material that is readily applied through thermoplastic equipment at temperatures between 400 and 425 °F.

(b) Toxicity

When temperatures are up to and including 445 °F, materials must not give off fumes that are toxic or otherwise injurious to persons, animals, or property.

(c) Material Stability

Provide materials that do not break down or deteriorate when temperatures are held at 400°F for 4 hours.

(d) Temperature versus Characteristics

The temperature versus viscosity characteristics of the material in the plastic state must remain constant throughout up to four (4) reheatings to 400 °F, and from batch-to-batch.

(e) Chemical Resistance

Produce material that is unaffected by contact with sodium chloride, calcium chloride, or other similar chemicals on the roadway surface by contact with the oil content of the pavement materials, or by contact from oil droppings from traffic.

(f) Softening Point

Provide materials that soften at 194 °F when tested by the ring and ball method (ASTM E28).

(g) Color

The daytime CIE chromaticity coordinates of the material must fall within an area having the following corner points:

Table 855:0B
Daytime CIE Chromaticity Coordinate Corner Points

	1		2		3		4		Brightness (Y)
	x	y	x	y	x	y	x	y	
Yellow	.435	.429	.510	.489	.460	.400	.560	.440	30-60

The yellow material must meet the specified color requirements listed in Table 855:0B for yellow before and after 500 hours for yellow of Weather-Ometer exposure. Weather-Ometer exposure will be in accordance with ASTM G155 using Exposure Cycle 1 with a quartz inner filter glass and Type "S" Borosilicate outer filter glass.

The nighttime CIE chromaticity coordinates for yellow thermoplastic, when utilizing a retro-reflectometer capable of measuring night color of pavement markings in accordance with ASTM E1710, must fall within an area having the following corner points during the life of the stripe:

Table 855:0C
Nighttime CIE Chromaticity Coordinate Corner Points

	1		2		3		4		5	
	x	y	x	y	x	y	x	y	x	y
Yellow	.53	.47	.49	.44	.50	.42	.51	.40	.57	.43

Traffic stripe materials shall be characterized as non-hazardous as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, and the material shall not exude fumes which are hazardous, toxic or detrimental to persons or property. Provide supporting independent analytical data or product material safety data sheets (MSDS) identifying non-hazardous designations.

Additionally, ensure the traffic stripe materials contain no more than 5.0 ppm lead by weight when tested in accordance with the RCRA reference above. Provide supporting independent analytical data.

(h) Formulation

Table 855:0D	
Yellow	% by Weight
Binder	20 min
C.I. Pigment Yellow 83	1.5 min
Calcium Carbonate	20-42
Glass Traffic Beads	30-45
Total	100

855.04 CONSTRUCTION METHODS

B. Application of Markings *(Add the following:)*

In the event that temperatures and conditions are not conducive to the installation of permanent pavement markings within the specified time frame, the Engineer may allow and accept the installation of temporary pavement markings in lieu of permanent markings at no additional cost to the Department. Maintain the temporary markings until temperatures and conditions are conducive for permanent striping.

E. Retro-reflectivity

(1) Minimum Retro-reflectivity *(Replace with the following:)*

Ensure longitudinal markings meet the minimum retro-reflectivity values in accordance with Table 855:2:

Table 855:2
Minimum Retro-reflectivity

White		Yellow	
mcd/m^2/lx	Contract unit price adjustment	mcd/m^2/lx	Contract unit price adjustment
≥ 450	100%	≥ 300	100%
400 - 449	75%	275 - 299	75%
250 - 399	50%	225 - 274	50%
< 250	Remove and replace	< 225	Remove and replace

(2) Measurement *(Replace with the following:)*

Measure retroreflectivity of markings within ten (10) calendar days of placement, after removing loose beads.

Measure marking retroreflectivity in the direction of traffic, except the Department will allow yellow skip lines to be measured in either direction of traffic. One measurement (multiple readings) will represent each 2,500 ft [762 m] lot of single-color longitudinal stripe. The Department will not allow readings for adjacent lots to be taken closer than 1,000 ft [305 m] from each other.

For solid longitudinal stripes, one measurement represents the average of five readings per lot, taken at 3 ft [1 m] intervals along a randomly selected 15 ft [4.5 m] section of solid stripe.

For longitudinal skip stripes, one measurement represents the average of six readings per lot, two readings taken from each of three adjacent skip stripes. The Department will not allow readings taken within the first or last 1 ft [0.3 m] of skip stripes.

For non-compliant measurements, the Engineer will require additional measurements to determine the extent of non-compliance.

The Department will not require measurements of the following:

- Stop bars, crosswalks, gores, words, symbols
- Longitudinal striping installed using hand line machines
- Projects less than 1 mi (1.6 km) long

Obtain the Engineer's approval in writing before using a mobile retro-reflectometer system as an alternative measurement method.