



Florida Department of Transportation

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DENVER J. STUTLER, JR.
SECRETARY

MEMORANDUM

DATE: January 5, 2006

TO: Specification Review Distribution List

FROM: Duane F. Brautigam, P.E., State Specifications Engineer

SUBJECT: Proposed Specifications Change: 9710800 Traffic Marking Materials

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change to Section 971.

This change was proposed by Chester Henson of the State Roadway Design Office to delete Articles 971-8 and 971-9 due to the deletion of Sections 701 and 702.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at SP965DB or duane.brautigam@dot.state.fl.us. Comments received after February 2, 2006 may not be considered. Your input is encouraged.

DFB/bd

Attachment

COMMENTS:

Submitted by:

Phone #:

TRAFFIC MARKING MATERIALS.
(REV 01-04-06)

ARTICLES 971-8 - 971-11 (of the Supplemental Specifications) are deleted and the following substituted:

~~**971-8 Thermoplastic Materials for Raised Rib Shoulder Warning Devices.**~~

~~**971-8.1 General:** Upon cooling to normal pavement temperature, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall utilize alkyd based materials only and have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 701 shall apply regardless of the type of formulation used. The pigment, glass spheres, and filler shall be well dispersed in the resin. The material shall be free from all skins, dirt and foreign objects.~~

~~**971-8.2 Composition:**~~

Component	Test Method	White	Yellow
Binder		20.0% minimum	20.0% minimum
TiO ₂ , Type II Ructile	ASTM D 476	10.0% minimum	-
Glass Spheres	AASHTO T 250	40.0% minimum	40.0% minimum
Yellow Pigment		-	% minimum per manufacturer
Calcium Carbonate and Inert Filler (200 mesh [75 μm] sieve)		30.0% maximum	37.5% maximum

~~Percentages are by weight.~~

~~**971-8.3 Glass Spheres:** Glass spheres shall be Type 1 and meet the requirements of 971-2.~~

~~**971-8.4 Physical Requirements:** Laboratory samples shall be prepared in accordance with ASTM D 4960 and shall meet the following criteria:~~

Property	Test Method	Minimum	Maximum
Water Absorption	ASTM D 570	-	0.5%
Softening Point	ASTM E 28	212°F [100°C]	-
Low Temperature Stress Resistance	AASHTO T 250	Pass	-
Specific Gravity	Water displacement	1.9	2.3
Indentation Resistance	ASTM D 2240* Shore Durometer, A2	65	-
Impact Resistance	ASTM D 256, Method A	10 inch pound [1.0 N-m]	-
Flash Point	ASTM D 92	475°F [245°C]	-

~~*The durometer and panel shall be at least 77°F [25°C], but not exceeding 86°F [30°C] and a 4.4 lb [2 kg] load applied. After 15 seconds, the reading shall not be less than 65 units.~~

~~971-8.4.1 Set To Bear Traffic Time:~~ When applied at the temperatures and thickness specified by Section 711, the thermoplastic shall set to bear traffic in not more than 15 minutes.

~~971-8.4.2 Retroreflectivity:~~ The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 $\text{med/lx}\cdot\text{m}^2$ and not less than 250 $\text{med/lx}\cdot\text{m}^2$; respectively. The retroreflectance of the white and yellow pavement markings at the end of the one year service life shall not be less than 150 $\text{med/lx}\cdot\text{m}^2$.

~~971-8.4.3 Durability:~~ Durability is the measured percent of thermoplastic material completely removed from the pavement. The thermoplastic material line loss must not exceed 5.0% at the end of the three year service life.

~~971-8.5 Application Properties:~~ Application properties shall meet the requirements of Section 701.

~~971-8.6 Packing and Labeling:~~ The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lb [23 kg]. The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.

~~971-9 Materials for Inverted Profile, Wet Weather Traffic Stripes.~~

~~971-9.1 General:~~ Upon cooling to normal pavement temperature, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic and draining water from the highway surface. The manufacturer shall utilize alkyd based materials only and have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 702 shall apply regardless of the type of formulation used. The pigment, glass spheres, and filler shall be well dispersed in the resin. The material shall be free from all skins, dirt and foreign objects.

~~971-9.2 Composition:~~

Component	Test Method	White	Yellow
Binder		20.0% minimum	20.0% minimum
TiO ₂ , Type II Rucite	ASTM D 476	10.0% minimum	N/A
Glass Spheres (intermix)	ASTM D 1155	40.0% minimum	40.0% minimum
Yellow Pigment		N/A	% minimum per manufacturer
Calcium Carbonate and Inert Filler (-200 mesh [75 μm] sieve)		30.0% maximum	37.5% maximum
Lead	EPA Methods 3050 and 6010	3.0 ppm maximum	3.0 ppm maximum
Heavy Metals, Total (RCRA)	EPA Methods 3050 and 6010	100 ppm maximum	100 ppm maximum

Percentages are by weight.

~~971-9.3 Glass Spheres:~~ Glass spheres shall be determined by manufacturer's recommendations and meet the requirements of 971-2.

~~971-9.4 Physical Requirements: Laboratory samples shall be prepared in accordance with ASTM D 4960 and shall meet the following criteria:~~

Property	Test Method	Minimum	Maximum
Water Absorption	ASTM D 570	-	0.5%
Softening Point	ASTM D 36	200°F [93°C]	-
Low Temperature Stress Resistance	AASHTO T 250	Pass	-
Specific Gravity	Water displacement	1.9	2.3
Indentation Resistance	ASTM D 2240* Shore Durometer, A2	45	-
Impact Resistance	ASTM D 256, Method A	10 in-lb [1.0 N-m]	-
Flash Point	ASTM D 92	475°F [245°C]	-

*The durometer and panel shall be at 90°F [32°C] with a 4.4 lb [2.0 kg] load applied. Instrument measurement shall be taken after 15 seconds.

~~971-9.4.1 Set To Bear Traffic Time: When applied at the temperatures and thickness specified by Section 702, the striping material shall set to bear traffic in not more than two minutes.~~

~~971-9.4.2 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 med/lx-m² and not less than 250 med/lx-m²; respectively. The white and yellow traffic stripes and markings will also attain an initial wet retroreflectivity of not less than 150 med/lx-m² and not less than 125 med/lx-m², respectively. The retroreflectance of the white and yellow pavement markings at the end of the three year service life shall not be less than 150 med/lx-m², also the wet retroreflectivity at the end of the service life shall not be less than 75 med/lx-m².~~

~~971-9.4.3 Durability: Durability is the measured percent of thermoplastic material completely removed from the pavement. The thermoplastic material line loss must not exceed 5.0% at the end of the one year service life.~~

~~971-9.5 Application Properties: Application properties shall meet the requirements of Section 702.~~

~~971-9.6 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lb [23 kg]. The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.~~

971-108 Permanent Tape Materials for Pavement Stripes and Markings.

971-108.1 General: The materials for pavement stripes and markings shall consist of white or yellow weather-resistant reflective film as specified herein. The markings are divided into two classes: Standard and High Performance. The classes are differentiated by their durability and retroreflectivity. The pigment, glass spheres, and filler shall be well dispersed in the resin. However, the requirements delineated in this Specification and Section 713 shall apply. The material shall be free from all skins, dirt and foreign objects.

971-108.2 Composition: The pavement stripes and markings shall consist of high-quality plastic materials, pigments, and glass spheres uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres embedded in the top surface.

971-108.3 Skid Resistance: The surface of the stripes and markings shall provide a minimum skid resistance value of 35 BPN (British Pendulum Number) when tested according to ASTM E 303. Bike lane symbols and pedestrian crosswalks shall provide a minimum skid resistance value of 55 BPN.

971-108.4 Thickness: The Qualified Products List will list the specified thickness of each approved product.

971-108.5 Durability and Wear Resistance: When properly applied, the material shall provide neat, durable stripes and markings. The materials shall provide a cushioned resilient substrate that reduces sphere crushing and loss. The film shall be weather resistant and, through normal wear, shall show no significant tearing, rollback or other signs of poor adhesion. Durability is the measured percent of pavement marking material completely removed from the pavement. The pavement marking material line loss must not exceed 5.0% of surface area at the end of its service life.

971-108.6 Conformability and Resealing: The stripes and markings shall be capable of conforming to pavement contours, breaks and faults under traffic at pavement temperatures recommended by the manufacturer. The film shall be capable of use for patching worn areas of the same types of film in accordance with the manufacturer's recommendations.

971-108.7 Tensile Strength: The stripes and markings shall have a minimum tensile strength of 40 psi [275 kPa] when tested according to ASTM D 638. A rectangular test specimen 6 by 1 by 0.05 [150 by 25 by 1.5 mm] minimum thickness shall be tested at a temperature range of 40 to 80°F [21 to 27°C] using a jaw speed of 0.25 inch/min [6 mm/min].

971-108.8 Elongation: The stripes and markings shall have a minimum elongation of 25% when tested in accordance with ASTM D 638.

971-108.9 Plastic Pull test: The stripes and markings shall support a dead weight of 4 lb [1.8 kg] for not less than five minutes at a temperature range of 70 to 80°F [21 to 27°C]. Rectangular test specimen size shall be 6 by 1 by 0.05 inch [150 by 25 by 1.5 mm] minimum thickness.

971-108.10 Pigmentation: The pigment shall be selected and blended to provide a material which is white or yellow conforming to standard highway colors through the expected life of the stripes and markings.

971-108.11 Glass Spheres: The glass spheres shall meet the requirements of 971-2.

The stripes and markings shall have glass retention qualities such that, when at room temperature a 2 by 6 inches [50 by 150 mm] specimen is bent over a 0.5 inch [13 mm] diameter mandrel axis, a microscopic examination of the area on the mandrel shall show no more than 10% of the spheres with entrapment by the material of less than 40%. The bead adhesion shall be such that spheres are not easily removed when the film surface is scratched firmly with a thumbnail.

971-108.12 Standard Markings: The preformed materials for pavement stripes and markings shall have a service life of three year. The materials shall attain an initial retroreflectance of not less than 300 mcd/lx·m² *for white and contrast markings* and not less than 250 mcd/lx·m² *for yellow markings, respectively*. The retroreflectance of the white, yellow and contrast pavement markings at the end of the three year service life shall not be less than 150 mcd/lx·m².

971-108.13 High Performance Markings: The preformed materials for pavement stripes and markings shall have a service life of five years. The materials shall attain an initial retroreflectance of not less than 450 mcd/lx·m² for white and contrast markings and not less than 350 mcd/lx·m² for yellow markings. The pavement stripes and markings shall retain a minimum retroreflectance for two years of not less than 300 mcd/lx·m² for white and contrast markings and

not less than 250 mcd/lx·m² for yellow markings. The retroreflectance of the white, yellow and contrast pavement markings at the end of the five year service life shall not be less than 150 mcd/lx·m².

971-119 Two Reactive Component Materials For Traffic Stripes And Markings.

971-119.1 General: Two reactive component materials intended for use under this Specification shall include, but not be limited to, epoxies, polyesters and urethanes. Upon curing, these materials shall produce an adherent, reflective pavement marking capable of resisting deformation by traffic. The manufacturer shall have the option of formulating the material according to his own specifications. However, the criteria outlined in this Specification and Section 709 shall apply regardless of the type of formulation used. In a cured condition, all of the products designated in this Specification shall be classified as non-hazardous waste as defined by 40 CFR 261.24 when tested in accordance with EPA Method 1311, Toxicity Characteristics Leaching Procedures (TCLP). The material shall not exude fumes which are toxic or detrimental to persons or property. The material shall be free from all skins, dirt and foreign objects.

971-119.2 Composition:

Component	Test Method	Criteria
TiO ₂ , Type II Rutile (white paint only)	ASTM D 476	minimum 10% by weight
Lead	EPA 1311 (TCLP)	maximum 0.15 ppm
Volatile Organic Content, (VOC)	ASTM D 3960	maximum 150 g/L

971-119.3 Pigment: The yellow pigment used shall not contain lead or any other Resource Recovery and Conservation Act (RCRA) materials.

971-119.4 Glass Spheres: Glass spheres shall be Type 1 and meet the requirements of 971-2.

971-119.5 Sharp Silica Sand: Sharp silica sand used for bike lane symbols and longitudinal lines shall meet the following gradation requirements:

Sieve Size	% Passing
20 mils [850 µm]	100
50 mils [300 µm]	0 to 10

971-119.6 Physical Requirements: The material shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Dry Opacity*	Fed Std 141a Method 4121	0.96	-
Bleed Ratio	Fed Spec TT-P-85D	0.95	-
Flexibility	Fed Spec TT-P-115D	Pass	-
Abrasion Resistance	971-12.6.3	Pass	-

*When applied at manufacturer's recommended dry film thickness.

971-119.6.1 Set To Bear Traffic Time: When applied at the temperatures and thickness specified by Section 710, the material shall set to bear traffic in not more than two minutes.

971-~~119~~.6.2 Abrasion Resistance: Test four samples per LOT using a Taber Abrader. The paint shall be applied to specimen plates using a drawdown blade having a clearance of 26 mils [660 μm]. Air dry each sample for 30 minutes and bake at 220°F [105°C] for 18 hours. Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with 1.1 lb [500 g] weights and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 0.178 oz [50 mg] per plate.

971-~~119~~.6.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than ~~45300~~ $\text{mcd/lx}\cdot\text{m}^2$ and not less than 350 $\text{mcd/lx}\cdot\text{m}^2$, respectively. The retroreflectance of the white and yellow pavement markings at the end of the one year service life shall not be less than 150 $\text{mcd/lx}\cdot\text{m}^2$.

971-~~119~~.7 Application Properties: Application properties shall meet the requirements of Section 709.

971-~~119~~.8 Packaging and Labeling: The two reactive component material shall be placed in 55 gal [210 liter] open-end steel drums with a re-usable multi-seal sponge gasket. No more than 50 gal [190 liters] of material shall be placed in any drum to allow for expansion during transport and storage. Other containers will be used for applicable products. Each container shall designate the color, generic type (e.g. epoxy), user information, manufacturer's name and address, batch number and date of manufacture. Each batch manufactured shall have a unique number. The label shall warn the user of hazards associated with handling or using the material.

971-~~119~~.9 Storage Life: Any material stored for less than one year not meeting these requirements shall be replaced at no cost to the Department.

