Florida Department of Transportation

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Tallahassee, FL 32399-0450

KEVIN J. THIBAULT, P.E.
SECRETARY

June 30, 2021

Khoa Nguyen
Director, Office of Technical Services
Federal Highway Administration
3500 Financial Plaza, Suite 400
Tallahassee, Florida 32312

Re: State Specifications Office
Section: **970**
Proposed Specification: **9700000 MATERIALS FOR RAISED PAVEMENT MARKERS AND BITUMINOUS ADHESIVE.**

Dear Mr. Nguyen:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

The changes are proposed by Kenneth Bergum to add requirements for epoxy adhesive for use with Raised Pavement Markers, add packaging and labeling requirements for adhesives, and include extra documentation requirements to raised pavement markers to the Standard Specification. This revision is associated with revised Specification 1020200 and revised Section 706.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to daniel.strickland@dot.state.fl.us.

If you have any questions relating to this specification change, please call me at 414-4130.

Sincerely,

Daniel Strickland, P.E.
State Specifications Engineer

DS/dh
Attachment
cc: Florida Transportation Builders' Assoc.
State Construction Engineer

MATERIALS FOR RAISED PAVEMENT MARKERS AND BITUMINOUS ADHESIVE. (REV 5-11-21)

SECTION 970 is deleted and the following substituted:

SECTION 970
MATERIALS FOR RAISED PAVEMENT MARKERS AND ~~BITUMINOUS~~ ADHESIVE

970-1 Raised Pavement Markers (RPMs).

Manufacturers seeking evaluation of their product for the Approved Product List (APL) must submit an application in accordance with Section 6 and provide documentation showing the product is in conformance with this section.

RPMs shall be classified in accordance with the following chart:

Table 970-1
RPM Class

Class	Description	Usage	Expected Normal Service	ASTM D4280 Surface Designation
B	Retroreflective	Temporary/Permanent	Long life	H, hard abrasion-resistant lens
D	Retroreflective	Temporary	One month	None
F	Internally Illuminated	Permanent	Long life	H, hard abrasion-resistant lens

970-2 Performance Requirements.

970-2.1 Class B RPMs: The RPMs shall meet the performance requirements specified in ASTM D4280, Section 6.2, for luminous intensity, flexural strength, compressive strength, resistance to cracking, and thermal cycling, as modified herein.

Submit product photo, product data sheet, and documentation from the National Transportation Product Evaluation Program (NTPEP) showing that the RPMs meet the requirements of this Section.

970-2.1.1 Composition: The RPM shall consist of materials conforming to ASTM D4280.

970-2.1.2 Physical Requirements: The physical size of the RPM shall conform to the requirements of ASTM D4280. Laboratory and field samples for RPMs and bituminous adhesives shall meet the requirements of ASTM D4280 and include the following requirements:

The minimum area of each retroreflective face shall be 2.5 square inches. The minimum base size shall be 12 square inches.

970-2.1.3 Abrasion Resistant: Meet the coefficient of luminous intensity requirements of ASTM D4280 after abrasion.

970-2.1.4 In-Service Minimum Retroreflective Intensity: Class B RPMs shall retain a minimum coefficient of luminous intensity for 18 months of not less than 30% of the values shown in Table 1 of ASTM D4280, and a minimum luminous intensity of 0.2 cd/fc at the end of two years.

970-2.2 Class D RPMs: Submit ~~documentation~~ product photo, product data sheet, and certified test reports from an independent laboratory showing that the RPMs meet the requirements of this Section.

970-2.2.1 Body Requirements: Provide RPMs made of nonferrous material. RPM dimensions are based on an x and y axis where the y dimension is parallel to the centerline and the x axis is 90° to the y axis.

The base must be approximately 4 inches along the x axis and approximately 1 inch along the y axis.

The vertical wall must be a minimum of 4 inches long with a minimum height of 2 inches and a maximum height of 3 inches with retroreflective sheeting affixed to the upper portion of the vertical wall. The retroreflective sheeting must be a minimum of 0.25 inch in width and extend the full length of the vertical wall.

970-2.2.2 Color Requirements: The color of the body and the retroreflective strips must be yellow.

970-2.2.3 Flexibility and Deformation Resistance: The vertical wall of the tabs must be flexible to bend under normal traffic and resistant to permanent deformation for a minimum of one month.

970-2.2.4 Adhesion: Provide tabs that adhere to the pavement such that no tab dislodges.

970-2.2.5 Retroreflective Sheeting: Provide retroreflective sheeting of Type IV or greater and meet the requirements of Section 994.

970-2.2.6 Removability: Ensure the entire RPM is removable without damaging the asphalt surface.

970-2.3 Class F RPMs: Submit ~~documentation~~product photo, product data sheet, and certified test reports from an independent laboratory showing that the RPMs meet the requirements of this Section.

970-2.3.1 Functional Requirements: RPMs must be steadily-illuminated.

970-2.3.2 Electrical Requirements: Electrical power for the RPM must be provided by solar power.

RPMs must meet the performance requirements for at least 16 hours of continuous duty without sunlight. Charging time must be less than 3 hours during sunny conditions and less than 8 hours during cloudy conditions. Operation must be controlled by a photoreceptor located inside the RPM.

970-2.3.3 Physical Requirements: RPMs must have a maximum width of eight inches. The depth of embedment of the RPM housing into pavement must be 2.5 inches or less, and the housing must project 0.75 inches or less above the pavement surface.

RPMs must have a compressive strength of 20,000 pounds.

RPMs must have an IP 68 rating.

970-2.3.4 Performance Requirements: The light source for RPMs must be light-emitting diodes (LEDs).

The light produced by the RPM must only be visible from the direction of traffic that it is intended to guide. No light produced by the RPM should be visible when viewed from a height of 3.5 feet above the pavement at a distance of 20 feet from the opposite quadrant or side quadrants of the RPM's LED projection quadrant.

RPMs must be capable of producing the following luminance values when measured at the LED source:

Table 970-2 RPM Color and Luminance	
Color	Luminance (Foot-candle)
White	5.00
Yellow	1.00
Red	1.50
Blue	0.10

The RPM lenses must meet the abrasion-resistant requirements of ASTM D4280. After abrading the RPM, the luminance produced by the RPM must be 50% or greater than the values in the above table.

970-2.3.5 Warranty: The manufacturer must provide a five-year, non-prorated warranty on all components for five years from the date of final acceptance in accordance with Section 706.

~~**970-3 Packaging and Labeling.**~~

~~Shipment shall be made in containers which are acceptable to common carriers and packaged in a manner which ensures delivery in perfect condition. Each package shall be clearly marked with the APL number, name of the manufacturer, type, color, quantity enclosed and date of manufacture. Show the designation of the Class B marker in accordance with ASTM D4280.~~

970-43 ~~Bituminous~~ Adhesive for Class B and F Raised Pavement Markers.

970-43.1 General: ~~Bituminous a~~Adhesive as recommended by the RPM manufacturer shall be used for bonding the RPM to the pavement. Manufacturers seeking evaluation of their product for the APL must submit an application in accordance with Section 6 and provide documentation showing the product is in conformance with this section.

970-43.2 Specific Requirements for Bituminous Adhesives: The bituminous adhesive shall meet the properties of adhesives per ASTM D4280 Section A1, including filler-free and filler alone properties.

970-43.3 ~~Performance~~Specific Requirements for Epoxy Adhesives: The ~~performance of the~~ epoxy adhesive shall ~~be determined in accordance with the test methods listed in ASTM D4280.~~ conform to the following requirements of AASHTO M 237 for types I and II (Table 970-3).

Table 970-3					
		Type I		Type II	
Property	Test Method	Min.	Max.	Min.	Max.
Viscosity: Component A (Resin) TD Spindle at 5 rev/min, poises	AASHTO T 237	3,500	5,000	1,000	3,000
Viscosity: Component B (Hardener) TD Spindle at 5 rev/min, poises		3,500	5,000	1,000	3,000
Shear Ratio (Each Component)		2.0		2.0	
Gel Time, Minutes	AASHTO T 237	6	10	6	10
Bond Strength to Concrete, max. time, minutes to reach 200 psi	AASHTO T 237		35		210
Density lbs/gal. Component A (Resin)	AASHTO T 237	11.7	12.2	10.6	10.9
Component B (Hardener)		11.7	12.2	11.3	11.6
Slant Shear Strength (Dry) 24 hr, psi	AASHTO T 237	1,000		2,000	
Slant Shear Strength (Wet) 24 hr, psi		800		1,500	

~~**970-4 Bituminous Adhesive for Class B Raised Pavement Markers.**~~

~~**970-4.1 General:** Bituminous adhesive as recommended by the RPM manufacturer shall be used for bonding the RPM to the pavement.~~

~~**970-4.2 Specific Requirements for Bituminous Adhesives:** The bituminous adhesive shall meet the properties of adhesives per ASTM D4280 Section A1, including filler-free and filler alone properties.~~

~~**970-4.3 Performance Requirements:** The performance of the adhesive shall be determined in accordance with the test methods listed in ASTM D4280.~~

970-~~3~~4 Packaging and Labeling.

970-4.1 Raised Pavement Markers: Shipment shall be made in containers which are acceptable to common carriers and packaged in a manner which ensures delivery in perfect condition. Each package shall be clearly marked with the APL number, name of the manufacturer, type, color, quantity enclosed and date of manufacture. Show the designation of the Class B marker in accordance with ASTM D4280.

970-4.2 Adhesives: Each package shall be clearly marked with the product name, name of the manufacturer, lot number, adhesive type, quantity enclosed, and date of manufacture.

970-5 Product Acceptance on the Project.

Acceptance will be made in accordance with the requirements of Sections 102 and 706.

MATERIALS FOR RAISED PAVEMENT MARKERS AND BITUMINOUS ADHESIVE. (REV 5-11-21)

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Shear Ratio (Each Component)		2.0		2.0	
Gel Time, Minutes	AASHTO T 237	6	10	6	10
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Slant Shear Strength (Dry) 24 hr, psi	AASHTO T 237	1,000		2,000	
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