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District/Divis	sion:		Created By:		Work Phone	:	
Materials	& Tests		✓ Travis Patton		(512) 506-58	341	
Spec Book Y	ear:		Addendum:		Deadline Dat	e:	
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Funding Type	e		* Select Use				'
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DMS9203	- Rapid Curing Aspha	altic Concrete	e Patching Material (Conta	inerized)			
DMS:			*DMS Number:				
🔿 New (	Revision		DMS-9203				
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Removing	DMS as an allowable	e specificatio	n. We would like to discon	tinue it's use.			
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Workflow Ac	tions			
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# DMS-9203 Rapid-Curing Asphaltic Concrete Patching Material (Containerized)



Effective Date: April 2024

1.	DESCRIPTION
	This Specification no longer exists.
1.1.	Archived Versions. Archived versions are available.

## 4/16/24, 6:09 PM

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XXXX-XX-XXX	Mate	rials & Tests	2024		MM/DD/YYYY		MM/DD/YYYY	
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Construction and Maintenance	~	Federal and Non-Federal	~	Select item		•		
Specification								
Replacement		<ul> <li>Required</li> <li>Optional</li> </ul>						
Proposed Specification Code:		Title:						
6XXX		MULTIPOLYMER PAVEME	NT MARKINGS WITH WAI	RRANTY				
							(x) Remove	+ New Item
Reference Items	Descri	ption					(c) Remove	T New Item
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6XXX-XXXX	MLTF	PLY PV MK W/WTY (W) (6") (SLD)		L	F Linear Feet	•		
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	MLTF	2LY PV MK W/WTY (W) (8") (DOT)		L	F Linear Feet	•		
□ 6XXX-XXXX	MLTF	PLY PV MK W/WTY (Y) (8") (SLD)		L	.F Linear Feet	•		
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## Special Provision

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1.

# Special Specification 60206XXX Multipolymer Pavement Markings (MPM) with Warranty



6020

#### DESCRIPTION

Furnish and place <u>Multipolymer Pavement Markings (MPM)</u> as shown on the plans. Provide a manufacturer's warranty bond for longitudinal lines for a 3-yr. period. The Department will allow a Contractor provided warranty bond in lieu of the manufacturer's bond if all conditions of the manufacturer's warranty including the requirements of this Item are met. In such case, the Contractor is responsible for the meeting the warranty requirements. Use the form provided by the Department.

#### 2. MATERIALS

Multipolymer Pavement Marking Materials. Use materials that produce an adherent, retroreflective pavement marking system that meets all of the performance requirements of this Item. Use materials that do not result in the generation of any hazardous materials/wastes, as defined in Article 1.58., "Hazardous Materials or Waste," during application or removal. If requested, provide a laboratory report from a commercial laboratory indicating material used does not result in the generation of any hazardous materials/wastes, as defined in Article 1.58, during application or removal.

Use a multipolymer resin material, which is:

2-component (a predominantly multipolymer pigmented resin component with a curing agent component);

100% solids, producing no toxic fumes when heated to application temperature;

track-free in less than 40 min.; and

formulated and tested to perform as a pavement marking material with glass spheres applied to the surface.

Before work begins, provide a laboratory report from an independent testing laboratory showing that the initial color of each material selected for use conforms to the color limits set forth in Table 1, measured by 45°/0° geometry CIE, D65 Illuminant, 2° standard observation angle in accordance with ASTM E1347, E1348, or E1349.

Non-Reflectorized Contrast or Shadow Markings. The marking material used for the contrast or shadow marking must conform to the same formulation, material, prequalification and sampling requirements with the exception of the following items:

color pigment used;

glass spheres must be replaced with a black, color-fast, anti-skid material.

Before work begins, provide a laboratory report from an independent testing laboratory showing that the initial color of each material selected for use conforms to the color limits set forth in Table 1, measured by 45°/0° geometry CIE, D65 Illuminant, 2° standard observation angle in accordance with ASTM E1347, E1348, or E1349.Use multipolymer pavement markings that meet the requirements of DMS-8230, "Multipolymer Pavement Markings."

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# **Commented [A1]:** Removed the materials info and just referenced the new DMS

3.	EQUIPMENT					
	Provide equipment as required or directed according to the following (The provider of the warranty bond is responsible for providing equipment during the warranty period unless otherwise shown on the plans.):					
3.1.	Preparation and Application. Use equipment designed for the pavement <u>surface</u> preparation and application of the type of MPM material selected. <u>These equipment devices should meet the requirement of Article 666.3.</u>					
3.2.	<b>Colorimeter</b> . Provide a colorimeter using 45°/0° geometry CIE, D65 Illuminant, 2° standard observation angle meeting the requirements of ASTM E1347, E1348, or E1349.					
3.3.	Retroreflectometer. Unless otherwise shown on the plans, provide a portable or mobile retroreflectometer meeting the following requirements.					
<u>3.3.1.</u>	Portable Retroreflectometer, Provide a portable retroreflectometer that meets the requirements of ASTM E1710.:	[	Commented	[A2]: Added ma	aterial to make it co	onsistent with item 666
	<ul> <li>Uses 30-meter geometry and meets the requirements described in ASTM E1710;</li> </ul>					
	Has either an internal Global Positioning System (GPS) or the ability to be linked with an external GPS					
	with a minimum location accuracy of 16.5 ft., in accordance with the Circular Error Probability (CEP)					
	method (CEP is the radius of the circle with its origin at a known position that encompasses 50% of the					
	readings returned from the GPS instrument); and					
	Can record and export the GPS location and retroreflectivity readings for each measurement					
3.3.1.	Mobile Retroreflectometer, Provide a mobile retroreflectometer that	[	Commented	[A3]: Modified	material to make it	consistent with item
<del>3.3.2.</del>	is approved by the Construction Materials and Tests Division (CSTMTD) and certified by the Texas A&M Transportation Institute (ITI) Mobile Retroreflectometer Certification Program for project evaluation of retroreflectivity.					
333	is calibrated daily, before measuring retroreflectivity on any payement string, with a portable					
0.0.0.	retroreflectometer meeting the following requirements: ASTM E1710, entrance and a of 88 76°, observation					
	angle of 1.05° and an accuracy of +15%					
3.3.4.	requires no traffic control when retroreflectivity measurements are taken and is capable of taking continuous readings at posted speeds					
<del>3.3.5.<u>3.3.2.</u></del>	Furnish mobile retroreflectivity measurements in compliance with Special Specification Mobile Retroreflectivity Data Collection for Pavement Markings unless otherwise approved by the Engineer. The					
	Engineer may require an occasional field comparison check with a portable retroreflectometer meeting the requirements listed above to insure accuracy.					
4.	CONSTRUCTION					
	Place markings before opening the road to traffic, unless short-term or work zone markings are allowed.					
4.1.	General. <u>Prepare the pavement surface using controlled techniques that minimize pavement damage and hazards to the traveling public. Apply the MPM materials, according to the manufacturer's recommendations, using widths, colors, shapes, and at locations as shown on the plans.</u>					
<u>4.1.</u>						

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Obtain Obtain approval for the sequence of work and estimated daily production. Minimize interference to roadway operations when placing markings on roadways open to traffic. Use traffic control as shown on the plans or as approved. Protect all markings placed under open-traffic conditions from traffic damage and disfigurement. Replace markings when more than 5% of the markings are damaged or disfigured.

Establish guides to mark the lateral location of pavement markings as shown on the plans or as directed, and have guide locations verified. Use material for guides that will not leave a permanent mark on the roadway.

Apply markings on completely dry pavement that passes the followingdryness test:

Pplace a 1-sq. ft. piece of clear plastic on the pavement and weigh down the edges. The pavement is considered dry if, when inspected after 15 min., no condensation has occurred on the underside of the plastic.

Apply markings:

- in conformance with the manufacturer's recommendations-;
- using personnel skilled and experienced in installation of pavement markings;
- using widths and colors shown on the plans;
- at locations shown on the plans;
- in proper alignment with the guides; without deviating from the alignment more than 1 in. per 200 ft. of roadway, or more than 2 in. maximum;
- without abrupt deviations;
- free of blisters and with no more than 5% holes or voids (percent by area);
- with uniform cross-section, density, and thickness;
- with clean and reasonably square ends:
- that meet the requirements of Tex-828-B;
- that meet the color and minimum retroreflectivity requirements; and
- during favorable weather based on the manufacturer's recommendations, unless otherwise directed.

If markings are placed at Contractor option when inclement weather is impending and the markings are damaged by subsequent precipitation, the Contractor is responsible for all required replacement costs.

Remove all applied markings that are not in alignment or sequence as shown on the plans or in accordance with the specifications at the Contractor's expense, in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment\_approval for the sequence of work and estimated daily production. Use traffic control as shown on the plans or as approved. Establish guides to mark the lateral location of pavement markings as shown on the plans or as approved. Establish guides to work locations verified. Use material for guides that will not leave a permanent mark on the roadway. Apply markings in alignment with the guides and without deviating for the alignment more than 1 in. per 200 ft. of roadway or more than 2 in. maximum. Remove all applied markings that are not in alignment or sequence as stated in the specifications at the Contractor's expense and in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment.

- 4.2. Surface Preparation. Prepare the pavement surface using controlled techniques that minimize pavement damage and hazards to the traveling public. Prepare surfaces in accordance with this Section unless otherwise shown on the plans.
- 4.2.1.
   Surface Cleaning for Pavement Marking Applications on New Asphalt Surfaces with No Existing

   Pavement Markings and for Retracing of Existing Pavement Markings on All Surfaces. Use air blast or broom to clean the pavement surface to remove loose material unless otherwise shown on the plans. If cleaning is needed beyond what is specified, Engineer can use force account to compensate for the extra

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effort. This is mainly applied when the pavement is covered with thick layer of dirt or mud or there is grass growing on the pavement.

 
 4.2.2.
 Surface Cleaning for All Concrete Surfaces and Asphalt Surfaces Only When Specified in the Plans (Excludes New Asphalt Surfaces with No Existing Pavement Markings and Retracing). Clean surfaces in accordance with Item 678, "Pavement Surface Preparation for Markings," to remove curing membrane, dirt, grease, existing loose and flaking construction markings, and other forms of contamination.

4.2.4.3. Initial Performance Requirements. Meet Article 5, "Performance Requirements," initially, after installation. <u>The Contractor is responsible for traffic control when conducting performance evaluations</u>, Perform an initial performance evaluation after <u>307</u> and before <u>4560</u> days after MPM are installed to verify that the MPM meet the initial performance requirements in Article 5 for retroreflectivity. Conduct initial retroreflectivity evaluations of placed pavement markings with either a portable or mobile retroreflectometer, unless otherwise shown on the plans, according to Section 5.4.2., "Retroreflectivity <u>Measurements</u>." <del>The Contractor is responsible for</del> traffic control when conducting performance evaluations.

For color and durability, the Engineer will conduct a visual evaluation and require Contractor testing only if MPM do not appear to meet the performance requirements in Article 5.

For MPM not meeting performance requirements, repair or replace until reevaluation shows the MPM meet the performance requirements as approved by the Engineer.

4.3.4.4. Written Acceptance. The Department will provide written acceptance after the Contractor meets the initial performance requirements. This written acceptance (see attached sample form) will include the date, location, length, and type of MPM.

#### 5. PERFORMANCE REQUIREMENTS

5.1. **Color**. Provide MPM consisting of pigments blended to provide color conforming to standard highway colors as shown in Table 1.

Table 1										
Color Requirements (Initial and Maintained)							Brightness(Y)			
Federal 505 Color		1		2	3	3	4	L .	Initial	Maintained
999-COIOI	x	у	x	у	x	у	x	у	Initial	Mantaneu
White 17855	<u>0</u> .290	<u>0</u> .315	<u>0</u> .310	<u>0</u> .295	<u>0</u> .350	<u>0</u> .340	<u>0</u> .330	<u>0</u> .360	60 min	-
Yellow 33538	<u>0.435</u> . 470	<u>0.429-</u> 4 <del>55</del>	<u>0.510</u> . <del>510</del>	<u>0.489</u> . 489	<u>0.460</u> - 4 <del>90</del>	<u>0.400-</u> 4 <del>32</del>	<u>0.560</u> . 537	<u>0.440</u> - 462	30 <u>-60</u> min	-
Black	<u>0.355</u>	<u>0.355</u>	<u>0.305</u>	<u>0.305</u>	<u>0.285</u>	<u>0.325</u>	<u>0.335</u>	<u>0.375</u>	5 max	<u>15 max</u>

**Commented [A4]:** these values are the same as prefab tape DMS 8240, but different from thermo DMS 8220. Changed to thermo values which are less restrictive; because it is a warranty spec and wanted to be fair and allow for some reasonable color change.

5.2.

Retroreflectivity. Provide MPM meeting the minimum retroreflectivity values listed in Table 2.

Table 2

Minimum Retroremectivity Requirements							
Color	Initial Retroreflectivity,	Maintained Retroreflectivity,					
COIOI	mcd/m²/lx	mcd/m²/lx <del>, Min</del>					
White	400	175					
Yellow	<u>250</u>	125					

5.3.

**Durability**. Provide MPM that do not lose more than 5% of the striping material in a 1-ft. section of continuous stripe or broken stripe (25 broken stripes). Pavement markings must remain in the proper <u>shape</u>, alignment, and location.

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5.4.	Performance Evaluation Procedures. Provide traffic control and conduct evaluations of color, retroreflectivity, and durability as required or directed.	
5.4.1.	<b>Color</b> . Measure color using 45°/0° geometry CIE, D65 Illuminant, 2° standard observation angle in accordance with ASTM E1347, E1348, or E1349. <u>Conduct evaluations at locations approved by the Engineer.</u>	
<u>5.4.2.</u>	Retroreflectivity Measurements. Unless otherwise shown on the plans, conduct retroreflectivity evaluations of pavement markings with either a portable or mobile retroreflectometer.	<b>Commented [A5]:</b> expanded these subsections to be consistent with Item 666
<u>5.4.2.1.</u>	Mobile Retroreflectometer Measurements, Make all measurements in the direction of traffic flow,           except for broken centerline on 2-way roadways, where measurements will be made in both           directions. At not cost to the Agency, Flurnish mobile retroreflectivity measurements in accordance with           ttem 667, "Mobile Retroreflectivity Data Collection for Pavement Markings," unless otherwise approved by           the Engineer. Mobile Retroreflectometer should be verified daily, before measuring retroreflectivity on any           pavement stripe, with a calibrated portable retroreflectometer. The Engineer may require aadditional field           comparison checks using a calibrated portable retroreflectometer for verification and to ensure accuracy. Use           all equipment in conformance with the manufacturer's recommendations and directions. Inform the Engineer           and TTI at least 24 hr. before taking any measurements.           Provide mobile measurement averages for every 0.1 mi. unless otherwise specified or approved. Take           measurements on each section of roadway for each series of markings (e.g., edge line, center skip line, and           each line of a double line) and for each direction of traffic flow. Measure each line in both directions for           center skip lines in both directions).	
<del>5.4.1.1.</del>	-Portable Retroreflectometer Measurements.	
<u>5.4.2.2</u>	If using a portable retroreflectometer, take a minimum of one measurement every mile on each series of markings (i.e., edgeline, center skipline, each line of a double line, etc.), at approved locations. If more than one measurement is taken, average the measurements. For all markings measured in both directions, take a minimum of one measurement in each direction. If the measurement taken on a specific series of markings within each mile segment falls below the minimum retroreflectivity values, take a minimum of 5 more measurements within that mile segment for that series of marking. If the average of these 5 measurements falls below the minimum retroreflectivity requirements, that mile segment of the applied markings does not meet the performance requirement.Provide portable measurement averages for every 1.0 mi. unless otherwise specified or approved. Using a portable reflectometer, take at least 20 measurements for each 1-mi. section of roadway for each series of markings (e.g., edge line, center skip line, and each line of a double line) and direction of traffic flow. Measure each line in both directions for centerlines on two-way roadways (i.e., measure both double solid lines in both directions and measure all center skip lines in both directions). The spacing between each measurement must be at least 100 ft. The Engineer may decrease the mileage frequency for measurements if concerns arise.	Formatted: Tab stops: Not at 0.5" + 1.25"
5.4.2.3.	Retroreflectivity Data Analysis. A marking meets the retroreflectivity requirements if the combined average retroreflectivity measurement for a 1-mi. segment meets the minimum retroreflectivity values specified, and no more than 20% of the retroreflectivity measurement values within that 1-mi. segment are below the minimum retroreflectivity requirements value within that 1-mi. segment.         The 1-mi. segment will start from the beginning of the data collection and end after a mile's worth of measurements have been taken. Each subsequent mile of measurements will be a new segment. Centerlines with two stripes (either solid or broken) will result in 2 mi. of data for each mile segment. Each centerline stripe must be tested for compliance as a stand-alone stripe.	
<del>5.4.2.</del>		
	If using a mobile retroreflectometer, review the results to determine deficient sections and deficient areas of interest. These areas do not meet the performance requirements.	<b>Commented [A6]:</b> This gives little guidance on what constitutes failing. Removed and replaced with item 666 language

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5.4.3. Durability. Measure durability in accordance with ASTM D913 for marking material loss, and visually inspection for alignment and location. Conduct evaluations at locations approved by the Engineer.

#### 6. WARRANTY REQUIREMENTS

The warranty requirements apply to the longitudinal lines only. Transverse and gore markings, symbols, words, etc. will not require warranty.

Each warranty period is for 3 yr. and starts the day after written acceptance.

The warrantor is responsible for meeting Article 5, "Performance Requirements," for the duration of the warranty period.

During the warranty period, the Engineer will conduct periodic visual performance evaluations of MPM. For retroreflectivity, the Engineer will use Tex-828-B, "Determining Functional Characteristics of Pavement Markings." The warrantor may be present during these evaluations. For areas, which, in the opinion of the Engineer, have a questionable visual evaluation, the warrantor may replace the MPM or may conduct a performance evaluation for the performance requirement in question, according to Section 5.D4, "Performance Evaluation Procedures." Conduct retroreflectivity evaluations according to Section 5.D4.2, "Retroreflectivity <u>Measurements</u>," using either <u>a</u> portable or mobile retroreflectometer unless otherwise shown on the plans. The warrantor is responsible for traffic control when conducting performance evaluations.

The warrantor will replace MPM that fails to meet the color, retroreflectivity, or durability performance requirements during the warranty period. Within 15 days after notification, place new markings in accordance with Article 4, "Construction."

All replacement MPM must meet the materials and performance requirements of this specification.

The end of the warranty period does not relieve the warrantor from the performance deficiencies requiring corrective action identified during the warranty period.

The Engineer may exclude MPM from the replacement provisions of the warranty period, provided the Engineer determines that the failure is a result of outside causes rather than defective material <u>or improper</u> <u>installment</u>. Examples of outside causes are <u>extreme wear at intersections</u>, damage by snow or ice removal, and <u>premature</u>-pavement failures.

Provide a contact name, address, and telephone number for notification of needed MPM replacement.

#### 7. MEASUREMENT

This Item will be measured by the foot; by each word, symbol, or shape; or by any other unit shown on the plans. Each stripe will be measured separately.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

#### 8. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Multipolymer Pavement Markings (<del>MPM)</del> with Warranty" of the type and color specified and the shape, width, and size specified as applicable, at the time

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of project acceptance. This price is full compensation for materials, application of MPM, equipment, labor, tools, <u>traffic control, testing</u>, and incidentals.



## MPM INSTALLATION RECORD FOR WRITTEN ACCEPTANCE

\*\* Warranty period begins the day after written acceptance.

COUNTY HIGHWAY	CONTROL PROJECT	LIMITS FROM LIMITS TO	LENGTH	TYPE MPM	ACCEPTANCE DATE

# Contractor signature \_\_\_\_\_ Date

Department signature

Date



6020

\_for

	CONTRACT NO.	
WARRANTY BOND	COUNTY	
	BOND NO	

KNOW ALL PERSONS BY THESE PRESENTS: That we, \_\_\_\_\_, manufacturer of or Contractor for multipolymer pavement markings, as Principal, and \_\_\_\_\_\_, as Surety, are held and firmly bound unto the State of Texas, as Obligee, in the penal sum of \_\_\_\_\_\_Dollars \$\_\_\_\_\_\_, lawful money of the United States, well and truly to be paid to the State of Texas, and we bind ourselves, our heirs, successors, executors, and administrators jointly and severally, firmly by these presents.

Whereas, the Principal is required to protect the Obligee against any defects resulting from faulty multipolymer pavement markings installed under said contract for a period of 3 years beginning the day after written acceptance.

Now, therefore, the condition of this obligation is such that if the above bounden principal, its heirs, successors, executors, and administrators shall promptly and faithfully carry out and perform the warranty as provided in said contract, and shall, within fifteen days of due notice, replace any installed multipolymer pavement markings that may fail to meet Obligee's performance evaluation as provided for in the Contract during the period specified above or shall pay over, make good, and reimburse to the said Obligee all loss and damage that said Obligee may sustain by reason of failure or default of said Principal so to do, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

Provided further that the end of a warranty period shall not relieve Principal from its obligation to correct deficiencies requiring corrective action, so long as those deficiencies are identified during the warranty period.

	WITNESS our hand this	day of	20
	(Wa	arrantor Name)	
		* By:	
	**SURETY (Print Firm Name and Seal)		(Warrantor Officer)
By:		* By:	
	(Title)		(Warrantor Officer)
	**SURETY (Print Firm Name and Seal)	**	SURETY (Print Firm Name and Seal)
By:		By:	
	(Title)		(Title)

Note:

\* Attach a Power of Attorney showing that the officer of the warrantor has authority to sign this obligation.

\*\* Attach a Power of Attorney showing that the surety officer or Attorney-In-Fact has authority to sign this obligation; the Power of Attorney and bond must be impressed with the corporate seal. The surety must be a US Treasury listed company and provide notification information.



## 4/16/24, 6:18 PM

## TxDOTCONNECT

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6XXX-XXXX	PREFE	3 PV MK W/WNTY TY B (W)(6")(S	SLD)			LF Linear Feet	•		
6XXX-XXXX	PREFE	3 PV MK W/WNTY TY B(W)6"(BRI	K)CNTST			LF Linear Feet	•		
6XXX-XXXX	PREFE	3 PV MK W/WNTY TY B(W)6"(SLI	D)CNTST			LF Linear Feet	•		
6XXX-XXXX	PREFE	3 PV MK W/WNTY TY B (Y)(6")(Bl	RK)			LF Linear Feet	•		
6XXX-XXXX	PREFE	3 PV MK W/WNTY TY B (Y)(6")(SI	LD)			LF Linear Feet	•		
6XXX-XXXX	PREFE	3 PV MK W/WNTY TY B(Y)6"(BRK	()CNTST			LF Linear Feet	•		
	DDEE	ם היין אאוי אאיאודע דע היעלע אייר איירס ה	NONITOT			I E I Sanna Ennt			
Remove + New Item									
Special Provision								⊗ Remove	+ New
Special Provision	Title					Description			Repla

<ul> <li>Remove + New Item</li> </ul>					•
O00 Provision				Remove     Remove	+ New Item
000 Provision	Title	Replacing	Existing 000 Provision		
4				_	Þ
Remove + New Item					,
*Change Summary:					
This is Special Specification 6019 submitted	for 2024 publication. It has been modified to be consistent with Ite	m 666 and 668. It also inco	rporates Special Provisions		

#### 6019

# Special Specification 60196XXX Longitudinal Prefabricated Pavement Markings (PPM) with Warranty



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<del>3.3.3.<u>3.3.2.</u></del>	is approved by the Construction Division (CST) and certified by the Texas Transportation Institute Mobile	
	Retroreflectometer Certification Program for project evaluation of retroreflectivity	
<del>3.3.4</del> .	is calibrated daily, before measuring retroreflectivity on any pavement stripe, with a portable retroreflectometer meeting the following requirements: ASTM E1710, entrance angle of 88.76°, observation angle of 1.05°, and an accuracy of $\pm$ 15%; and	
3.3.5.	requires no traffic control when retroreflectivity measurements are taken and is capable of taking continuous readings at or near posted speeds	
<del>3.3.6.</del>	Furnish mobile retroreflectivity measurements in compliance with Special Specification, "Mobile Retroreflectivity Data Collection for Pavement Markings," unless otherwise approved by the Engineer. The Engineer may require an occasional field comparison check with a portable retroreflectometer meeting the requirements listed above to ensure accuracy.	
4.	CONSTRUCTION	Commented [A3]: Updated this section to match Item 668
<u>4.1.</u>	General. Prepare the pavement surface using controlled techniques that minimize pavement damage and hazards to the traveling public. Apply the PPM materials according to the manufacturer's recommendations, using widths, colors, and shapes at locations as shown on the plans. Obtain approval for the sequence of work and estimated daily production. Use traffic control as shown on the plans or as approved. Remove all waste generated from the jobsite before the end of each working day.	
	Establish guides to mark the lateral-location of pavement markings as shown on the plans or as directed and have guide locations verified. Use guide material that will not leave a permanent mark on the roadway.	
	Place material in alignment with the guides without deviating from the alignment more than 1 in. per 200 ft. of roadway or more than 2 in. maximum, and with no abrupt deviations. Remove all applied markings that are not in alignment or sequence as stated in the plans or as stated in the specifications at the Contractor's expense and in accordance with Item 677, "Eliminating Existing Pavement Markings and Markers," except for measurement and payment.	
<u>4.2.</u>	Dimensions. Place material in conformance with the color, length, width, shape, and configuration shown on the plans. Locate alignment as shown on the plans or as directed.	
<u>4.3.</u>	Placement Limitations.	
<u>4.3.1.</u>	Moisture. Apply material to pavement that is completely dry. Pavement will be considered dry if, on a sunny day after 15 min., no condensation occurs on the underside of a 1-sq. ft. piece of clear plastic that has been placed on the pavement and weighted on the edges.	
<u>4.3.2.</u>	Temperature. Follow pavement and ambient air temperature requirements recommended by the material manufacturer. Do not place material when the pavement temperature is below 60°F or above 120°F if the material manufacturer does not establish temperature requirements.	
<u>4.4.</u>	Surface Preparation. Prepare the pavement surface using controlled techniques that minimize pavement damage and hazards to the traveling public. Prepare surface using any approved cleaning method that effectively removes contaminants, loose materials, and conditions deleterious to proper adhesion. Abrasive or water-blast cleaning is not required unless otherwise shown on the plans. Blast clean, when required, in accordance with Item 678, "Pavement Surface Preparation for Markings." Prepare surfaces further after cleaning by sealing or priming as recommended by the pavement marking material manufacturer or as directed. Use adhesive, when required, of the type and guality recommended by the pavement marking material manufacturer. Do not clean concrete pavement surfaces by grinding.	

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	Methods. Place all materials in conformance with the material manufacturer's instructions, as well as the this	
	Item requirements for surface condition, moisture, and temperature requirements in accordance with this	
	Rem, uness onerwise unecleu.	
4145	Surface Preparation Prepare surface using any approved cleaning method that effectively removes	
	contaminants loose materials and conditions deleterious to proner adhesion. Abrasive or water blast	
	cleaning is not required unless otherwise shown on the plans. Blast clean, when required, in accordance with	
	Hem 678 "Payement Surface Preparation for Markings," Prepare surfaces further after cleaning by sealing or	
	priming as recommended by the payement marking material manufacturer or as directed. Like a dhesiye	
	when required of the type and quality recommended by the payament marking material manufacturer. Do	
	not clean concrete payement surfaces by grinding. Obtain approval for the sequence of work and estimated	
	daily production. Use traffic control as shown on the plans or as approved. Establish duides to mark the	
	lateral location of payment markings as shown on the plans or as directed, and have quide locations	
	verified lise material for quides that will not leave a permanent mark on the roadway. Apply markings in	
	alignment with the guides and without deviating for the alignment more than 1 in per 200 ft of roadway or	
	more than 2 in maximum. Bemove all applied markings that are not in alignment or sequence as stated in	
	the plans or as stated in the specifications at the Contractor's expense and in accordance with Item 677.	
	"Eliminating Existing Pavement Markings and Markers," except for measurement and payment-	
4 <del>.2.</del> 4.6.	Initial Performance Requirements. Meet Article 5, "Performance Requirements" initially, after installation.	
	Markings shall also present uniform and distinctive retroreflectance when inspected in accordance with Tex-	
	828-B.	
	The Engineer will conduct visual performance evaluations of PPM. For markings that do not meet the	
	Engineer's visual performance evaluation, the Contractor may present test results for color (using a	
	colorimeter), retroreflectivity (using a retroreflectometer in accordance with this Item), and durability (in	
	accordance with ASTM D913) for the Engineer's use in making acceptance or rejection decisions.	
	For PPM not meeting performance requirements, repair or replace until reevaluation shows the PPM meet	
	the performance requirements as approved by the Engineer.	
4 <del>.3.</del>		
4.4. <u>4.7.</u>	Written Acceptance. The Department will provide written acceptance after the Contractor meets the initial	
	performance requirements. This written acceptance (see attached sample form) will include the date,	
	location, length, and type of PPM.	
5.	PERFORMANCE REQUIREMENTS	
5.1.	Color. Provide PPM consisting of pigments blended to provide color conforming to highway colors as shown	
	in Table 1.	
	Table 1	
	Color Requirements (Initial and Maintained)	
	Federal Chromaticity Coordinates Brightness	
	595     1     2     3     4     (Y)       Color	
	Unitial X Y X Y X Y X Y Initial Maintained	
	VVIIILE .290 .310 .310 .293 .330 .340 .330 .300 00 MIII _	
	Yellow 0 89 40 55 .490 .432 .537 .462 30 <u>-60 Min</u> <u>-</u>	Commented [A4]: reordered
	Black .355 .355 .305 .305 .285 .325 .335 .375 5 Max 15 Max	
		Commented [A5]: Added these values, from Black thermo [

5.2.

Retroreflectivity. Provide PPM for longitudinal markings meeting the minimum <u>Dry retroreflectivity</u> Retroreflectivity values listed in Table 2.

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		Table : Minimum Dry Retroreflec	2 tivity Requirements
	Color	Initial Retroreflectivity,	Maintained Retroreflectivity,
	White	400	120
	Yellow	<u>250</u>	120
	When Wet Retrorefle	ectivity is required for white	or yellow pavement markings,
	pavement markings,	both white and yellow, the	y must maintain a minimum co
	luminance of 75 mcc	<u>l/m²/lux; when measured at a scoordance with ASTM E</u>	t <u>"30-meter" geometry under a</u>
	continuous wetting 1		. 2002.
5.3.	Durability. Provide I	PPM that do not lose more	than 5% of the striping materia
	Continuous Stripe or Pavement markings	broken stripe (25 broken st must remain in the proper	ripes), when measured in according according and location. The matrix
	smear, spread, flow,	or tear by traffic action. Th	e markings shall present a nea
	free of excessive adl	hesive, ragged edges, and	irregular lines or contours.
54	Performance Evalu	ation Procedures Provide	e traffic control and conduct ev
	retroreflectivity, and	durability as required or dir	ected.
E 4 4	Color Massura colo	rusing 15°10° acometry C	IF DEE Illuminant 2° standars
5.4.1.	accordance with AS	TM E 1347. E 1348. or E 13	349. Conduct evaluations at log
	Engineer.	,,	
511			
<u>5.4.1.</u>			
<u>5.4.2.</u>	Retroreflectivity Me	easurements. Unless other	wise shown on the plans, con
	of pavement marking	as with either a portable or	mobile retroreflectometer.
<u>5.4.2.1.</u>	Mobile Retroreflect	ometer Measurements. A	t no cost to the Agency, Efurni
	measurements in ac	cordance with Item 667, "N	obile Retroreflectivity Data Co
	before measuring rei	troreflectivity on any paver	ngineer. Mobile Retroreflector
	meeting the requiren	nents of Section 3. The English	gineer may require an addition
	using a calibrated po	ortable retroreflectometer fo	r verification and to ensure ac
	24 hr. before taking	any measurements.	
	Provide mobile measurements on ea	surement averages for even	y 0.1 mi. unless otherwise spe each series of markings (e.g.
	each line of a double	e line) and for each direction	n of traffic flow. Measure each
	centerlines on two-w	ay roadways (i.e., measure	both double solid lines in both
	<u>center skip lines in b</u>	oth directions).	
<u>5.4.1.1.5.4.2.2.</u>	Portable Retrorefle	ctometer Measurements.	For dry retroreflectivity, provid
	averages for every 1	.0 mi. unless otherwise spe	ecified or approved. Using a po
	skip line, and each li	nts for each 1-mi. section of ne of a double line) and dir	ection of traffic flow. Measure (
	centerlines on two-w	ay roadways (i.e., measure	both double solid lines in both
	center skip lines in b	oth directions). The spacing	g between each measurement
	satisfactory results.	The Engineer may resume	the original number of measurements in the previo
	For wet retroreflectiv	ity, take at least three mea	surements for each mile of ser
	center skip line, and	each line of a double line)	and direction of traffic flow and

<mark>07-24</mark> Statewide measurements for each marking. The spacing between each measurement must be at least 100 ft. If the average of the three measurements taken on an individual marking falls below the minimum acceptable retroreflectivity value, take at least six additional measurements on that individual marking and average them. These six additional measurements must also be spaced at least 100 ft. apart. The Engineer may decrease the mileage frequency for measurements if the previous measurements provide satisfactory results. The Engineer may resume the original number of measurements if concerns arise.

5.4.1.2.5.4.2.3. Retroreflectivity Data Analysis. For dry retroreflectivity, a marking meets the retroreflectivity requirements if the combined average retroreflectivity measurement for a 1-mi. segment meets the minimum retroreflectivity values specified and no more than 20% of the retroreflectivity measurement values are below the minimum retroreflectivity requirements value within that 1-mi. segment.

For wet retroreflectivity, a marking meets the retroreflectivity requirements if either the average of the initial three readings or the average of the six additional readings for that 1-mi. segment meets the minimum retroreflectivity values specified.

5.4.2. The 1-mi. segment will start from the beginning of the data collection and end after a mile's worth of measurements have been taken. Each subsequent mile of measurements will be a new segment. Centerlines with two stripes (either solid or broken) will result in 2 mi. of data for each mile segment. Each centerline stripe must be tested for compliance as a stand-alone stripe. Retroreflectivity. Unless otherwise shown on the plans, conduct retroreflectivity evaluations of pavement markings with either a portable or mobile retroreflectometer. Make all measurements in the direction of traffic flow, except for broken centerline on 2-way roadways, where measurements will be made in both directions.

If using a portable retroreflectometer, take a minimum of 1 measurement every mile on each series of markings (i.e., edgeline, center skipline, each line of a double line, etc.), at locations approved by the Engineer. If more than 1 measurement is taken, average the measurements. For all markings measured in both directions, take a minimum of 1 measurement in each direction. If the measurement taken on a specific series of markings within each mile segment falls below the minimum retroreflectivity values, take a minimum of 5 more measurements at locations determined by the Engineer within that mile segment for that series of marking. If the average of these 5 measurements falls below the performance requirements, that mile segment of the applied markings does not meet the performance requirement.

If using a mobile retroreflectometer, review the results to determine deficient sections and deficient areas of interest. These areas do not meet the performance requirements.

5.4.3. **Durability**. Measure durability in accordance with ASTM D913 for marking material loss, and visual inspection for alignment and location. Conduct evaluations at locations approved by the Engineer. <u>Deviations</u> in alignment or location caused by, in the Engineer's opinion, pavement failure will not be considered as a failure of the pavement markings.

6. WARRANTY REQUIREMENTS

Each warranty period is for 6 yr. and starts from the day after written acceptance.

Wet retroreflectivity, when required as shown on the plans, will have a warranty period of 2 yr.

The marking warrantor is responsible for meeting Article 5, "Performance Requirements," for the duration of the warranty period.

During the warranty period, the Engineer will conduct periodic visual performance evaluations of PPM. For retroreflectivity the Engineer will use Tex-828-B, "Determining Functional Characteristics of Pavement Markings." The warrantor may be present during these evaluations. For areas, which, in the opinion of the

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**Commented [A10]:** This gives little guidance on what constitutes failing. (Item 666)

Commented [A11]: Added to incorporate special provision warranty period for wet retro.

Engineer, have a questionable visual evaluation, the warrantor may replace the PPM or may conduct a performance evaluation for the performance requirement in question, according to Section 5.4., "Performance Evaluation Procedures." Conduct retroreflectivity evaluations according to Section 5.4., "Retroreflectivity," using either portable or mobile retroreflectometer unless otherwise shown on the plans. The warrantor is responsible for traffic control when conducting performance evaluations. The warrantor will replace PPM that fails to meet the color, retroreflectivity, or durability performance requirements during the warranty period. Replace PPM that fails to meet the performance requirements within 30 days of notification.

All replacement PPM must meet the materials and performance requirements of this specification, under the following conditions to complete the warranty period:

If the longitudinal PPM fails to meet the performance requirements in Article 5 in Years 1 through 4, use materials meeting Type B requirements of specification DMS-8240.

If the longitudinal PPM fails to meet the performance requirements in Article 5 in Years 5 or 6, with Engineer <u>approval</u>, use <u>one the following options to meet the performance requirements of Article 5:-</u> materials that meet

- -Type B Marking meeting the requirements of DMS-8240 and this specification (Type A or B).;
   or-Type I High-Performance Markings of Item 666. "Retroreflectorized Pavement Markings", meeting the
- requirements of DMS-8220 and Item 666 Type I High Performance Markings.; or ■ Type III Markings of Item 666, meeting the requirements of DMS-8230 and Item 666. Type III Markings on the Department's MPL.

to meet the performance requirements of Article 5. Construction of the replacement markings shall follow Article 4 of this specification or Article 4 of Item 666 for the applicable marking material being applied.

The end of the warranty period does not relieve the warrantor from the performance deficiencies requiring corrective action identified during the warranty period.

The Engineer may exclude PPM from the replacement provisions of the warranty period, provided the Engineer determines that the failure is a result of outside causes rather than defective material <u>or improper</u> <u>installment</u>. Examples of outside causes are <u>extreme wear at intersections</u>, damage by snow or ice removal, and <u>premature</u>-pavement failures.

Provide a contact person, address and telephone number for notification of needed PPM replacement.

#### 7. MEASUREMENT

This Item will be measured by the foot or by any other unit shown on the plans. Each stripe will be measured separately.

This is a plans quantity measurement Item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

#### 8. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Longitudinal Prefabricated Pavement Markings (PPM) with Warranty" of the color, shape and width, specified as applicable, at the time of project acceptance. This price is full compensation for materials, application of longitudinal PPM, <u>traffic control</u>, testing, warranty work, equipment, labor, tools, and incidentals. **Commented [A12]:** There is no Type A material in DMS 8240. Potentially allowing multipolymer or other ...

## WMS-PPM INSTALLATION RECORD FOR WRITTEN ACCEPTANCE

\*\* Warranty period begins the day after written acceptance.

COUNTY HIGHWAY	CONTROL PROJECT	LIMITS FROM LIMITS TO	LENGTH	ТҮРЕ РРМ	ACCEPTANCE DATE

Contractor Signature	Date
Department Signature	Date

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	CONTRACT NO.	
WARRANTY BOND	COUNTY	
	BOND NO	

KNOW ALL PERSONS BY THESE PRES		, man	ufacturer of	or Contracto	or foi		
prefabricated pavement markings, as Principal, a		, 8	as Surety, ar	e held and f	irmly		
bound unto the State of Texas, as Obligee, in the		Dollars	s \$	, la	awfu		
money of the United States, well and truly to be pa	ind ourselves, ou	r heirs, succe	ssors, execu	itors			
and administrators jointly and severally, firmly by	these present	ts.					
Whereas, the above bounden	Principal	has	provided	prefabricated	pavement	markings	to

\_\_\_\_\_\_for the foregoing contract entered into between \_\_\_\_\_\_ and the Öbligee, attached hereto; and

Whereas, the Principal is required to protect the Obligee against any defects resulting from faulty prefabricated pavement markings installed under said contract for a period of 6 years beginning the day after written acceptance.

Now, therefore, the condition of this obligation is such that if the above bounden principal, its heirs, successors, executors, and administrators shall promptly and faithfully carry out and perform the warranty as provided in said contract, and shall, within thirty days of due notice, replace any installed prefabricated pavement markings that may fail to meet Obligee's performance evaluation as provided for in the Contract during the period specified above or shall pay over, make good, and reimburse to the said Obligee all loss and damage that said Obligee may sustain by reason of failure or default of said Principal so to do, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

Provided further that the end of a warranty period shall not relieve Principal from its obligation to correct deficiencies requiring corrective action, so long as those deficiencies are identified during the warranty period.

WITNESS our hand this	day of	20
(Warrantor Name)		
	* B)	:
**SURETY (Print Firm Name	and Seal)	(Warrantor Officer)
* By:	* Ву	:
(Title)		(Warrantor Officer)
**SURETY (Print Firm Name	and Seal)	**SURETY (Print Firm Name and Seal)
* By:	* By	:
(Title)		(Title)

Note:

\* Attach a Power of Attorney showing that the officer of the installing contractor has authority to sign this obligation. \*\* Attach a Power of Attorney showing that the surety officer or Attorney-In-Fact has authority to sign this obligation; the Power of Attorney and bond must be impressed with the corporate seal. The surety must be a US Treasury listed company and provide notification information.

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