



2016 ROAD AND BRIDGE SPECIFICATIONS

[DIVISION VII—TRAFFIC CONTROL DEVICES](#)

SPECIAL PROVISION COPIED NOTES (SPCNs), SPECIAL PROVISION (SPs) and SUPPLEMENTAL SPECIFICATIONS (SSs)

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GUIDELINES – Asphalt projects (surface treatment only). Not needed when Volume 2 surface treatment is used. {2007-c704cm1}

[cn704-000100-00](#)

SWEEPING PRIOR TO PAVEMENT MARKING — No earlier than 7 days after completion of surface treatment the Contractor shall sweep the roadway surface prior to installation of permanent pavement markings. Permanent pavement markings shall be installed within 30 calendar days after completion of surface treatment placement. The cost of sweeping the roadway prior to installing pavement marking shall be included in the price bid for pavement marking.

7-28-14; Reissued 7-12-16 (SPCN)

GUIDELINES – Asphalt resurfacing (surface treatment, slurry seal and latex only). Not needed when Volume 2 surface treatment and slurry/latex is used. {2007-c704bm1}

[cn704-000110-00](#)

COVERING CLEANING AND INSPECTING EXISTING RAISED PAVEMENT MARKERS — The Contractor shall cover all existing raised pavement markers with a non-stick covering. The Contractor shall ensure that no resurfacing material, duct tape, or adhesive comes into contact with the retroreflector. The covering shall extend to include an area of 12 inches in front and in back of the casting, and the entire width of the casting.

After completion of the resurfacing operation, the covering shall be removed. If the existing raised pavement marker retroreflectors are dirtied during paving operations (including dirtying from adhesive residue), they shall be fully cleaned or replaced by the Contractor to ensure minimum retroreflectivity as defined in Section 235 of the Specifications. Any raised markers (including retroreflectors and/or castings) damaged by the Contractor's operations shall be replaced by the Contractor and properly disposed of at no expense to the Department. Replacement castings shall not be placed in the same location as the existing castings. The void left by the dislodged casting shall be repaired according to the Specifications, and the replacement raised pavement marker properly installed in a new location at least 3 inches from the repair.

The covering, cleaning, and inspection of the raised markers will not be measured for payment. All cost for performing this work shall be included in the price bid for other items of work.

9-17-15c; Reissued 7-12-16 (SPCN)

[cq703-000410-00](#)

GUIDELINES – For use on all projects containing Selective-View Traffic Signals.

PAYMENT FOR SELECTIVE-VIEW TRAFFIC SIGNALS – Selective-view traffic signals shall conform to Section 703 of the Specifications, the Standard Drawings, and the Plans. The backplate shall be as shown on the Plans.

Traffic signal head section (size) selective-view will be measured in units of each and will be paid for at the Contract each price. This price shall include post or pole, conduit, concrete foundation, grounding electrode, ground conductor, signal heads, breakaway connectors, sign panels, backplate installation, and mounting hardware.

1-25-19 (SPCN)

GUIDELINES — For projects with signs, signals or lighting that must conform to AASHTO's Standard Specifications for structural support for these items.

[SP700-000180-02](#)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
MODIFICATIONS TO AASHTO'S SIGN STRUCTURE SPECIFICATION

May 2, 2018

I. GENERAL REQUIREMENTS

Lighting (conventional and high mast), signal (overhead, mast arm and span wire), pedestal poles, overhead (span, cantilever and butterfly) sign structures, and ITS structures (camera poles, dynamic message signs (DMS), etc.) shall conform to the requirements of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition (LTS-6), 2013 with 2015 interims* as modified by this Special Provision. Any AASHTO Specification optional design parameter noted as "may be used at the discretion of the owner" that are not addressed in this document shall not be used for design.

Modifications to span or height limits shown on the plans shall be approved by the Regional Traffic Engineer.

II. WIND LOADING (LTS-6 Article 3.8 and Appendix C)

1. The alternate method for wind pressures provided in AASHTO Appendix C shall be used. Linear interpolation between wind contours is not permitted. The next higher contour shall be used for design. Reduced forces shall not be used for free swinging traffic signal and free swinging sign wind loadings.
2. **LTS-6 Article C.2** is supplemented with the following: Wind speeds using 50-year mean recurrence shall be used for all conventional light poles, high mast light poles, ITS device support poles, and overhead sign structures (span, cantilever and butterfly).
3. Mast arm signal poles, mast arms, and strain poles shall be designed using the following wind speeds:

VDOT Traffic Operations Region	VDOT Districts Within That Region	Design Wind Speed for strain poles, mast arms, and mast arm poles
Southwest	Bristol, Salem, and Lynchburg	70 MPH
Northwest	Staunton and Culpeper	70 MPH
Northern	Northern Virginia	80 MPH
Central	Richmond and Fredericksburg	80 MPH
Eastern	Hampton Roads	90 MPH

Mast arm signal pole and strain pole foundations shall be designed for wind speeds at the foundation location using the 25-year mean recurrence.

4. For special wind regions in Bristol District shown in Figure 3.8.3-2 of LTS-6, the selection of the design wind speed shall consider localized effects. The minimum design wind speed for 50 year mean in these areas is 90 MPH, 25 year mean in these areas is 80 MPH and 10 year mean in these areas is 70 MPH.
5. For structures elevated above the surrounding terrain (e.g. bridge mounted light pole, overhead sign, and other structures), the height factor shall be increased to account for the increased wind effects.

III. STEEL DESIGN

1. **Laminated Structures (LTS-6 Article C5.1):** Laminated or multi-ply structures shall only be used in tapered sections.
2. **Holes and Cutouts, Unreinforced and Reinforced (LTS-6 Article 5.14.5):** The location and size of hand holes and cutouts shall be in accordance with the details shown in the Standard Drawings. For high mast light poles, the width of unreinforced and reinforced holes and cutouts in the cross-sectional plane of the tube shall not be greater than 50 percent of the tube diameter at that section.
3. **Welding:** A connection detail using a full penetration groove weld with a backing ring may be considered for all traffic structures. For tubes 18” diameter and greater, the backing ring shall be attached at the top and bottom face of the ring using a continuous fillet weld. For tubes less than 18” diameter, the backing ring shall be attached at the bottom face using a continuous fillet weld and the top shall be caulked to provide a thick durable continuous seal. The caulk shall be a durable material approved by the Engineer which is formulated for this type of Industrial application..
4. **Diameter:** Mast arm signal pole structures shall have the following maximum column and arm outside diameters, unless otherwise approved by the Engineer.

Configuration	Arm Length	Design Loading	Max. column diameter at base of column	Max. arm diameter at base of arm
Dual arm	Length of one arm exceeds 70 feet or total length of both arms exceeds 130 feet	Varies (Project specific loads will be provided on the Plans)	22 inches	20 inches
	All other dual-arm structures	Design loading does not exceed Standard Drawing MP-3	20 inches	18 inches
Single arm	> 75 feet	Varies (Project specific loads will be provided on the Plans)	22 inches	20 inches
	≤ 75 feet	“Case 2” loading as per Standard Drawing MP-3	22 inches	20 inches

Configuration	Arm Length	Design Loading	Max. column diameter at base of column	Max. arm diameter at base of arm
		"Case 1" loading as per Standard Drawing MP-3	20 inches	18 inches

IV. FATIGUE DESIGN

- Fatigue Importance Categories (LTS-6 Article 11.6):** The following fatigue importance categories shall apply to structures:

Fatigue Importance Categories		
Structure Type	Span Length ¹ , ft.	Fatigue Category
All structures supporting dynamic message signs or partial dynamic message signs ³	All span lengths	Category I
Overhead sign span structure	> 150	Category I
	≤ 150	Category II
Overhead sign cantilever structure	> 50	Category I
	≤ 50	Category II
Overhead sign butterfly structure	All span lengths	Category II
Signal mast arm structure ²	> 75	Category I
	50 to ≤ 75	Category II
	< 50	No fatigue design required
Overhead signal structure	> 190	Category I
	≤ 190	Category II
High mast light poles	All lengths	Category I
Signal span wires, conventional lights poles and ITS device support poles (excluding DMS)		No fatigue design required

¹Span length is defined as center-to-center of column(s) for span structure and face-of-column to tip of arm for cantilever and signal structures.

²For twin mast arms, the pole, arms and connections shall be designed for the applicable fatigue category for the longest arm attached.

³Partial dynamic message signs may be treated as static signs for the purposes of determining Fatigue Category if the dynamic message portion of the sign does not exceed the thickness or weight of an equivalently-sized extruded aluminum sign.

- Mitigation Devices (LTS-6 Article 11.6 and 11.7.1):** Mitigation devices shall not be used in lieu of designing for fatigue.
- Aluminum light poles (LTS-6 Article 11.6 and 11.7.1):** Internal first and second mode vibration dampeners shall be provided and installed according to the manufacturer's instructions in all cases. External dampeners may be used if approved by the Engineer.

4. **Galloping Loads (LTS-6 Article 11.7.1):** Galloping loads shall not be considered in the design of overhead sign cantilevered structures with four chord trusses, signal mast arm structures, and multi-chord overhead signal structures.
5. **Truck-Induced Gust Loads (LTS-6 Article 11.7.1.3):** Truck induced gust loads shall not be considered in the design of signal mast arm and overhead signal structures.
6. **Vertical Deflection (LTS-6 Article 11.8):** The vertical deflection of the free end of the arm for overhead sign cantilevered structures due to the wind load effects of galloping or truck-induced gusts shall not exceed 8”.

V. FOUNDATION DESIGN

The AASHTO Standard Specifications for Highway Bridges, 1996, and the 1997 and 1998 Interim Specifications, as referenced in the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, are modified as follows:

1. **Geotechnical Design:** The factor of safety shall be as follows:

MINIMUM FACTORS OF SAFETY¹			
	Drilled Shaft		Spread Footing
	Overhead Sign Structures and all other types of ancillary structures except for Mast arm traffic Signals	Mast arm traffic Signals	
Tip resistance/ Bearing pressure	1.75	1.75	2.0
Torsion/Sliding/Skin Friction	2.0 ²	1.3 ²	1.2 ³
Overturning (Broms Method)	2.25	2.25	1.5

¹The factors of safety shown above already account for the 1.33/1.40 group overload/overstress factor. No reduction shall be applied to the design loading used in the analysis.

²Torsion Resistance shall be evaluated as specified by the AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (Seventh Edition, 2014) Section 10.8.3.5- Nominal Axial Compression Resistance of Single Drilled Shafts. A value of 1.0 shall be used in lieu of the resistance factors as shown in Table 10.5.5.2.4-1.

³Passive resistance shall be reduced by 50% to limit foundation movement.

In capacity calculations for the foundation design of a drilled shaft, the soil resistance of the top 1.5 feet shall be neglected in the analysis for torsion/skin friction/tip resistance. The full length of the shaft from the ground surface to the tip may be used in overturning/horizontal deflection. The remainder of the shaft may be assumed to be fully effective in supporting applied loads.

2. **Horizontal Deflection:** In lieu of Broms method, COM624P or other commercially available software may be used to evaluate the overturning of shafts and to estimate shaft deflections. For mast arm signals and span wire signals, the total horizontal deflection shall be limited to 0.75 inches at the ground level and the tip of the pile deflection shall not exceed -0.25 inches. For other structures, the total horizontal deflection shall be limited to 0.50 inches at the ground level and the tip of the pile deflection shall not exceed -0.15 inches. The loading used in the analysis shall not be reduced by the allowable overload/overstress factor. The shafts shall be modeled

such that the nonlinear flexural rigidity (non-linear EI, or “cracked” section) is accounted for when the horizontal deflections are calculated.

3. **Reinforcement:** Where tremie placement of concrete is anticipated, a minimum spacing of 5 inches or 10 times the size of the largest coarse aggregate whichever is greater shall be provided in both horizontal and vertical direction. For dry shafts, a smaller space of 5 times the size of the largest coarse aggregate may be considered. A dry shaft is when the amount of standing water in the base of the shaft prior to concreting is less than or equal to 3 inches and water is entering the shaft at a rate of less than 12 inches/hour.

GUIDELINES — For projects involving traffic signals requiring SM-3 Signal Head Mounting Details - Mast Arm and SMD-2 Sign Mounting Details.

[SP703-000100-00](#)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
MAST ARM HANGER ASSEMBLY STD SM-3 AND SMD-2

May 25, 2016; Issued July 12, 2016

I. Description

This work shall consist of furnishing and installing mast arm signal hanger assembly (Standard SM-3) and mast arm sign hanger assembly (Standard SMD-2) for new or relocated signals and signs on mast arms and replacing existing hanger assemblies.

II. Definitions

The following terms are used as follows in this special provision:

1. **Mast Arm Hanger Assembly (Complete):** An inclusive mast arm hanger assembly that consists of the main mount, swivel plate, mounting system, mounting tube, and miscellaneous hardware items.
2. **Mast Arm Hanger Assembly (Components):** Main mount, swivel plate, mounting system and miscellaneous hardware items (washers, screws, bolts, or nuts).
3. **Main Mount:** The bracket component that mounts against the mast arm signal pole. Once installed, this component is fixed and is not adjusted.
4. **Swivel Plate:** The bracket component(s) that mate to the main mount. The swivel plate can be adjusted along multiple axis to allow the signal mounting tube to be positioned at different angular orientations. The mounting tube is connected to the swivel plate.
5. **Mounting System:** Stainless steel cables which connect the main mount and mast arm signal pole.
6. **Mounting Tube:** The bracket component that holds the signal head assembly, camera, or sign panel bracing to the swivel plate.
7. **Miscellaneous items:** Other components of the hanger assembly not listed above, including but not limited to: tie back, or tether clamps which fasten the cable to the mounting tube; mounting arms; cover plates; hardware (washers, screws, bolts, or nuts); caps; and seals.
8. **Special Tools:** Unique tools identified by a specific item or product number in the manufacturer's installation instructions

III. Materials

As used below: XX, XXX or xx refers to stainless steel cable length, which shall be determined by the Contractor for the specific mast arm diameter at each installation location; YY or yy refers to the mounting tube length for sign panels, which shall be determined by the Contractor for the specific sign height at each location; ## refers to the channel width, which shall be determined by the Contractor for the specific sign width at each location.

1. Mast Arm Signal Hanger Assembly (Components) for Relocation or Maintenance Replacement – Signals

Mast arm hanger components (main mount, swivel plate, mounting system, and associated miscellaneous items) used for signal relocation or maintenance replacement of signal hanger assemblies shall be of the following or approved equal:

Table 1: MAST ARM SIGNAL HANGER ASSEMBLY (COMPONENTS) FOR RELOCATION OR MAINTENANCE REPLACEMENT - SIGNALS	
MANUFACTURER	MODEL
Pelco Products, Inc.	Galaxy, Model AB-3055-XX-SS-PNC
Traffic Hardware & Design	CAN-BRAC, Model CBL-VUB-2CXX-9
General Traffic Equipment Corp.	RM - MAC - XX
Cost Cast, Inc.	Cost Cast Item # 1816-A-CXX
Sky Bracket	SKYBRACKET, Model SS-SBCXX-SCK-VA

2. Mast Arm Signal Hanger Assembly (Complete) - Signals

Complete Mast Arm Hanger Assemblies used for new signals, relocated signals or maintenance replacement of signal hanger assemblies shall be of the following or approved equal:

Table 2: MAST ARM SIGNAL HANGER ASSEMBLY (COMPLETE) – SIGNALS (New Signals, Relocated Signals Or Maintenance Replacement)	
1-SECTION HEAD HANGER ASSEMBLY (IN LINE)	
MANUFACTURER	MODEL
Pelco Products, Inc.	Galaxy, Model AG-0125-1-XX-SS-PNC
Traffic Hardware & Design	CAN-BRAC, Model CBL-VUN1-T24-2Cyy-9
General Traffic Equipment Corp.	RM-1000C-XX-1
Cost Cast, Inc.	Cost Cast Item # 1816-G-CXX-24
Sky Bracket	SKYBRACKET, Model SS-SBCXX-18-VA
3-SECTION HEAD HANGER ASSEMBLY (IN LINE)	
MANUFACTURER	MODEL
Pelco Products, Inc.	Galaxy, Model AG-0125-3-XX-SS-PNC
Traffic Hardware & Design	CAN-BRAC, Model CBL-VUN1-T46-2Cyy-9
General Traffic Equipment Corp.	RM-1000C-xx-3
Cost Cast, Inc.	Cost Cast Item # 1816-G-CXX-48
Sky Bracket	SKYBRACKET, Model SS-SBCXX-46-VA
4-SECTION HEAD HANGER ASSEMBLY (IN LINE)	
MANUFACTURER	MODEL
Pelco Products, Inc.	Galaxy, Model AG-0125-4-XX-SS-PNC
Traffic Hardware & Design	CAN-BRAC, Model CBL-VUN1- T58-2Cyy-9
General Traffic Equipment Corp.	RM-1000C-xx-4
Cost Cast, Inc.	Cost Cast Item # 1816-G-CXX-60
Sky Bracket	SKYBRACKET, Model SS-SBCXX-60-VA

5-SECTION HEAD HANGER ASSEMBLY (CLUSTER)	
MANUFACTURER	MODEL
Pelco Products, Inc.	Galaxy, Model AG-0138-XX-SS-PNC
Traffic Hardware & Design	CBL-VUN2-14-T37-2CXX-9
General Traffic Equipment Corp.	RM-5C-5000C-xx
Cost Cast, Inc.	Cost Cast Item # 1816-G-CXX-5X
Sky Bracket	SKYBRACKET, Model SS-SBCXX-SCB-46-VA

3. Mast Arm Sign Hanger Assembly (Components) for Relocation or Maintenance Replacement – Signs

Mast Arm Hanger Assembly components (main mount, swivel plate, mounting system, and associated miscellaneous items) used for sign relocation or maintenance replacement of sign hanger assemblies shall be of the following or approved equal:

Table 3: MAST ARM SIGN HANGER ASSEMBLY (COMPONENTS) FOR RELOCATION OR MAINTENANCE REPLACEMENT - SIGNS	
MANUFACTURER	MODEL
Pelco Products, Inc.	Galaxy, Model AB-3055-XX-SS-PNC 1-Bracket per 16 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
Traffic Hardware & Design	CBS-HU-Exx-2Cyy-3 1-Bracket per 20 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
General Traffic Equipment Corp.	RM-MAC-XX 1-Bracket per 15 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
Cost Cast, Inc.	Cost Cast Item # 1816-A-Cxx 1-Bracket per 16 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
Sky Bracket	SKYBRACKET, Model SS-SBCXX-SCK-VA 1-Bracket per 13 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
Xcessories Squared	PAX2PC30-XXX and PASCL316-XXXX 1-Bracket per 10 Sq. Ft. of sign panel spaced per manufacturer's installation instructions

4. Mast Arm Sign Hanger Assembly (Complete) - Signs

Complete Mast Arm Hanger Assemblies used for new signs, relocated signs or maintenance replacement of sign hanger assemblies shall be of the following or approved equal:

Table 4: MAST ARM SIGN HANGER ASSEMBLY (COMPLETE) – SIGNS (New Signs, Relocated Signs Or Maintenance Replacements)	
MANUFACTURER	MODEL
Pelco Products, Inc.	Galaxy, Model AG-0142-XX-XX-SS-PNC Galaxy, Model AG-0144-XX-XX-SS-PNC 1-Bracket per 16 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
Traffic Hardware & Design	CAN-BRAC, Model CBS-HU-Exx-2Cyy-3 1-Bracket per 20 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
General Traffic Equipment Corp.	SMA - 3000 – XX 1-Bracket per 15 Sq. Ft. of sign panel spaced per manufacturer's installation instructions

Cost Cast, Inc.	Cost Cast Item # 1816-N-CXX-YY 1-Bracket per 16 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
Sky Bracket	SKYBRACKET, Model SS-SBXX-SBK-XXTK-##-VA 1-Bracket per 13 Sq. Ft. of sign panel spaced per manufacturer's installation instructions
Xcessories Squared	PAX2PC30-XXX and PASCL316-XXXX 1-Bracket per 10 Sq. Ft. of sign panel spaced per manufacturer's installation instructions

IV. Procedures

All work shall be accomplished according to the manufacturer's installation instructions. Only the tools, special tools, and anti-seize lubricants specifically noted in the manufacturer's installation instructions shall be used. If the Contractor deviates from the manufacturer's installation instructions, the Contractor shall provide documentation from the manufacturer authorizing such deviations, including the use of alternate tools.

If a bolt tightening sequence is not specified in the manufacturer installation instructions, bolts shall be tightened in an alternating pattern for even compression.

If a main mount with fully tightened bolts requires adjustment that necessitates loosening of the main mount bolts, the mounting system and associated hardware for the mounting system (washers, screws, bolts or nuts) shall be replaced at no additional cost to the Department.

1. **Tools:** If maximum torque values are provided in the manufacturer's installation instructions, a calibrated torque wrench shall be used to verify that torque has not been exceeded. The Contractor shall calibrate torque wrenches in accordance with torque wrench manufacturer recommendations at the interval recommended by the torque wrench manufacturer. The torque wrench calibration testing lab shall be ISO, or ANSI accredited for instrument calibration.

If special tools are identified in the manufacturer's instructions as being either required or recommended for installation the Contractor shall furnish no less than one set of tools to the Engineer per ten mast arm hanger assemblies or portion thereof, unless otherwise specified in the contract documents.

2. **Packaging:** All required components of each hanger assembly, except the mounting tube, shall be packaged as one set. The mounting tube may be packaged separately. If special tools are required, or recommended, they may be packaged separately. Under no circumstances shall the parts from multiple assemblies be mixed.
3. **New Signal or Sign Installations:** A Mast Arm Hanger Assembly (Complete) shall be used - see Table 2 for signals and Table 4 for signs.

The Mast Arm Hanger Assembly (Complete) may be attached to the mast arm and all bolts tightened to final tightness before lifting and placing the mast arm onto the signal pole (i.e. on the ground- attached to the mast arm prior to installation of the mast arm).

4. **Relocate Existing Mast Arm Hanger Assemblies for Signals or Signs:** Existing Mast Arm Hanger Assemblies (main mount, swivel plates, mounting systems and all associated miscellaneous items) that are in service before the commencement of any project shall not be relocated on the same mast arm or reused on a different mast arm.

The initial relocation of each existing signal or sign from its location at commencement of the project (Location A) to a new location on a mast arm (Location B) may be accomplished using one of the following at the new location on a mast arm:

- a. A new Mast Arm Hanger Assembly (Complete) – see Table 2 for signals and Table 4 for signs or
- b. New Mast Arm Hanger Assembly (Components) – see Table 1 for signals and Table 3 for signs. Existing mounting tubes, cover plates, tie backs, and tether clamps may be reused if they are compatible with the new components;

Subsequent relocations of the signal or sign from Location B to another location may be accomplished by the Contractor using one of the following at the new location on a mast arm:

- a. A new Mast Arm Hanger Assembly (Complete) – see Table 2 for signals and Table 4 for signs; or
- b. New Mast Arm Hanger Assembly (Components) – see Table 1 for signals and Table 3 for signs. Existing mounting tubes, cover plates, tie backs, and tether clamps may be reused if they are compatible with the new components; or
- c. New mounting system. The existing hanger assembly equipment installed for the initial relocation from Location A to Location B may be reused.

5. **Modify Existing Hanger Assembly:** Modifying an existing mast arm hanger assembly at the same location on a mast arm shall be accomplished in accordance with the following:

New Mast Arm Hanger Assembly (Components) – see Table 1 for signals and Table 3 for signs. Existing mounting tubes, cover plates, tie backs and tether clamps may be reused if they are compatible with the new components;

6. **Remove Existing Hanger Assembly:** Removing and disposing of an existing hanger assembly or components shall be in accordance with Section 510 of the Specifications.
7. **Prosecution of Work:** The Contractor shall prosecute work in accordance with Section 703.03 of the Specifications.

While performing this work, if the Contractor discovers any mechanical or electrical problems with the signals, or discovers any problems that require immediate repair, the Contractor shall log each problem by intersection and signal head and advise the Engineer immediately. The Engineer will instruct the Contractor how to proceed.

The Contractor shall exercise caution during prosecution of work to prevent damage to any existing wiring, or signal component. If the Contractor damages any existing wiring, or signal equipment, repair and replacement shall be at no additional cost to the Department.

V. Reporting

For each mast arm hanger assembly (Complete or Components) installed, the Contractor shall submit the attached Mast Arm Bracket Installation Report form to the Engineer. The form shall also be submitted to the Department's email hangerassemblies@vdot.virginia.gov.

Hard copy submission of the Mast Arm Bracket Installation Report to the Engineer shall not substitute for reporting to the required email address. The Mast Arm Bracket Installation Report shall be submitted within 7 business days of mast arm hanger assembly installation.

By submitting the report, the Contractor certifies that the mast arm hanger assembly installation was accomplished in strict conformance with these specifications.

Reporting will not be measured for separate payment but shall be considered incidental to the mast arm hanger assembly work.

VI. Warranty

The Contractor shall furnish a manufacturer warranty for the Complete Mast Arm Hanger Assembly or installed components to cover defects for a minimum of three years from the date of installation. The warranty shall include providing replacements, within 10 calendar days of notification, for defective parts and equipment at no additional cost to the Department. When the warranty normally given by the manufacturer is longer than three years, the manufacturer's normal warranty shall be furnished.

VII. Measurement and Payment

Mast Arm (Type) Hanger Assembly (Standard) will be measured in units of each for the standard and type specified to be paid for at the contract unit price per each. This price shall include furnishing and installing Mast Arm Hanger Assembly (Complete), including the main mount, swivel plate, mounting system, mounting tube, miscellaneous items, reporting, and special tools (when required).

Remove Existing Traffic Signal Head Assembly will be measured in units of each and will be paid for at the contract unit price per each. Signal head assembly is defined as one or more traffic signal head sections (vehicular or pedestrian) assembled as one unit. This price shall include disconnecting the signal head assembly from existing conductor cables, removing the signal head assembly and backplate, removing and disposing of hanger assembly, and removing all associated mounting equipment, hardware, and accessories. If the traffic signal head assembly is to be reinstalled, the price also shall include reconnecting signal cables. When designated in the contract for salvage or if salvage is directed by the Engineer, this price shall include storing, protecting, and delivering to a designated Department facility.

Relocate Existing Mast Arm (Signal or Sign) will be measured in units of each and will be paid for at the contract price per each. This price shall include removing and relocating an existing traffic sign, signal head, or pedestrian signal head from an existing to proposed location, disconnecting and reconnecting conductor cables, adjusting or relocating conductor cables, removing and disposing or salvaging the existing mast arm hanger assembly, installing a new Mast Arm Hanger Assembly (Complete) or installing new Mast Arm Hanger Assembly (Components) and relocating or replacing existing miscellaneous items.

When relocation of signals or signs is accomplished when maintenance of the traffic signal is the responsibility of the Contractor as specified in Section 512 for the items Modify Signal or Temporary Traffic Control Signal, relocating existing mast arm hanger assemblies for signals or signs will not be measured separately and the cost thereof shall be included in the contract unit price of Modify Signal or Temporary Traffic Control Signal.

Modify Existing Mast Arm Hanger Assembly (Type) will be measured in units of each and will be paid for at the contract price per each. This price shall include removing an existing traffic sign, signal head, or pedestrian signal head from the existing hanger, furnishing new hanger assembly components, disconnecting and reconnecting conductor cables, removing, salvaging, and disposing of existing mast arm hanger assembly components, installing new Mast Arm Hanger Assembly (Components) and reusing or replacing existing miscellaneous items.

Payment will be made under:

Pay Item	Pay Unit
Mast Arm (Type) Hanger Assembly (Standard)	Each
Remove Existing Traffic Signal Head Assembly	Each
Relocate Existing Mast Arm (Signal or Sign)	Each
Modify Existing Mast Arm Hanger Assembly (Type)	Each

GUIDELINES – ASPHALT PROJECTS (PLANT MIX ONLY).

SP703-000110-00

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
REPLACEMENT OF LOOP DETECTORS

March 16, 2017

I. Description

Loop Detectors shall be installed in accordance with the Section 703. Installation of loop detectors shall be performed in the presence of the Engineer.

II. Materials

Loop detector cables shall be No. 14 AWG stranded copper in accordance with Section 238. Loop sealant shall be from the Pre-Approved Traffic Control Device Listing.

New loop detectors shall be of the same size, configuration and locations as existing loop detector(s) unless otherwise indicated.

III. Procedures

When replacement of loop detectors is included in the Contract, the Contractor will be required to install new loop detector items either within the planed surface prior to the placement of new surface mix, or through the finished riding surface.

Loop detectors shall be installed at the depth specified in the TD-Series Standard Drawings for loop detectors installed in the planed surface or final riding surface, as applicable.

When an existing loop detector is taken out of service by the Contractor's planing operation, the Contractor shall have the new loop detector items installed and operational 96 hours after being taken out of service, unless otherwise stated in the Contract. In no case shall any loop detector be out of service for more than 96 hours. If the Contractor chooses to install new loop detector items through the final riding surface, all loop detector items shall be installed and operational within 96 hours after completion of the paving operations in the affected intersection.

The Contractor shall notify the Engineer at least 72 hours prior to planing at locations that contain loop detectors.

GUIDELINES – For projects where signal heads or signal head backplates are being replaced or installed at existing signal locations.

[SP703-000120-00](#)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SIGNAL HEAD MODULE AND SIGNAL HEAD BACKPLATE REPLACEMENT

May 8, 2018

I. DESCRIPTION

This work shall consist of replacing LED signal head modules, replacing backplates on existing signal heads, and installing backplates furnished by the Department on existing signal heads as shown on the Plans, in accordance with these Specifications and as directed by the Engineer.

II. MATERIALS

Signal head sections shall be in accordance with Sections 238 and 703 of the Specifications.

High Visibility Signal Backplates (HVSBs) shall conform to Sections 238 and 703 of the Specifications. Retroreflective fluorescent yellow sheeting shall be in accordance with Section 247 of the Specifications.

Existing plastic or aluminum composite backplates shall be replaced with aluminum composite HVSBs. Existing aluminum backplates may be replaced with aluminum or aluminum composite HVSBs, unless otherwise shown on the Plans.

When no backplate exists on an existing operational traffic signal head, the use and type of backplates shall be in accordance with the Contract unless otherwise directed by the Engineer.

III. REPLACE OR INSTALL HVSB BACKPLATE

When replacing backplates on existing traffic signal heads in operation with new HVSB backplates, the new backplate shall be neatly cut vertically near one of the lower corners to allow installation without disassembling the existing traffic signal head from the hanger equipment or disconnecting any existing conductor cables from the traffic signal head. The cut shall be a minimum of 1 inch from either traffic signal head attachment and be nearly inconspicuous and smooth without any gaps in the front surface of the backplate.

If the backplate is precut by the manufacturer, the cut shall be reconnected in accordance with the manufacturer's instructions. If the backplate is not precut, the reconnection panel shall be connected with 4 rivets to the backplate or as approved by the Engineer. The reconnection panel shall be a minimum 4 inches x 4 inches and shall be of the same material and color as the backplate it is connecting.

The Contractor shall visually assess the traffic signal heads and hanger assembly surfaces and connections before performing any modification. If during this visual assessment, the Contractor observes a damaged hanger assembly or other signal head equipment that needs to be repaired, replaced, or in the opinion of the Contractor poses risk to the Department or travelling public, the Contractor shall notify the Engineer. The Contractor shall not make any modification to the existing signal head, backplate, or hanger assembly at that location unless authorized by the Engineer.

The Contractor shall remove the existing backplates and associated hardware from the traffic signal head and install the new HVSB in a single work day, reconnecting the cut area if a cut has been made. Removing and installing backplates shall be performed without disconnecting the traffic signal head mounting hardware and conductor cables. Any signal head sections, backplates, or components damaged or lost at the fault of the Contractor shall be repaired or replaced at no additional cost to the Department.

The Contractor shall perform the work such that each intersection approach shall have consistent backplates on all traffic signal heads (either with the fluorescent yellow border or without) at the end of each work week unless otherwise directed by the Engineer.

IV. MEASUREMENT AND PAYMENT

Replace HVSB Backplate (signal head size and number) will be measured in units of each signal head assembly for the LED module size specified, and will be paid at the Contract each price. This price shall include visually assessing the existing signal head and hanger assembly, removing and disposing of existing backplate, and furnishing and installing new HVSB and attachment hardware.

Replace LED Module (size) will be measured in units of each for the module size specified, and will be paid at the Contract each price. This price shall include removing and disposing of existing module, furnishing and installing of new module, and connecting the new module to signal cables.

Install Backplate (signal head size and number) will be measured in units of each signal head assembly for the LED module size specified, and will be paid at the Contract each price. This price shall include picking up and installing backplate, visually assessing the existing signal head and hanger assembly, removing and disposing of existing backplate, and furnishing and installing attachment hardware.

Payment will be made under:

Pay Item	Pay Unit
Replace HVSB Backplate (signal head size and number)	Each
Replace LED Module (size)	Each
Install Backplate (signal head size and number)	Each

GUIDELINES – Surface treatment, slurry seal, latex emulsion treatment, and plant mix projects. {2007-S704M06}

[SP704-000100-03](#)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SECTION 704—PAVEMENT MARKINGS AND MARKERS

August 9, 2018

SECTION 704—PAVEMENT MARKINGS AND MARKERS of the Specifications is amended as follows:

Section 704.02(a) Pavement Markings is amended to add the following:

The sizes and shapes of symbols and characters shall match the size and shape specified in the Standard Drawings or elsewhere in the Contract. Hand-drawn or “stick” symbols or characters will not be allowed.

Section 704.02(e) Flexible Temporary Pavement Markers (FTPMS) is inserted as follows:

Flexible Temporary Pavement Markers (FTPMS) shall conform to Section 235 of the Specifications. All FTPMS shall be new product. FTPMS are suitable for use up to one year after the date of manufacture when stored in accordance with the manufacturer's recommendations.

The color of FTPM units and their reflective surfaces shall be the same color (white or yellow) as the temporary pavement markings they are being used in substitution for.

FTPMS shall consist of products from the Materials Division's Approved Products List No. 22. FTPMS shall include a removable material covering the reflective lens to protect the lens from being obscured or damaged during the paving operation.

Section 704.03—Procedures is amended by replacing the third and fourth paragraphs with the following:

The Contractor shall provide staking in the field that documents any changes in passing zones on undivided roads, exact placement of all aerial speed enforcement markings, and placement of railroad crossing markings. Any changes to these markings that are specified in the Contract shall be staked. The Contractor shall complete all staking and notify the Engineer at least 14 days prior to the scheduled start of resurfacing operations.

The Contractor shall reference this staking when installing temporary markings, and for the premarking to be done in advance of permanent marking installation. The stakes shall be removed at the conclusion of the project.

All existing markings shall be replaced with permanent markings of the same width, color, size, and location unless otherwise directed in the PM Series Standard Drawings, in the Contract, or by the Engineer. All existing markers shall be replaced with new markers with the same retroreflector colors (front and back) unless otherwise directed in the Contract or by the Engineer.

The Contractor shall sweep clear all surface-treated, slurry seal, and latex emulsion roadways prior to installation of permanent pavement markings. Any loose aggregate remaining on the surface shall be blown-out with an air compressor or other approved method.

Section 704.03—Procedures is amended by replacing the 13th paragraph with the following:

Non-truck mounted equipment shall be regulated to allow for calibration of the amount and type of material applied.

Section 704.03(a)2 Type B markings is amended to replace the third paragraph with the following:

Non-truck mounted equipment for application of thermoplastic material shall include an extrude die with a burner, temperature controller, agitator, and mechanical bead applicator to allow for the correct amount of material to be applied.

Section 704.03(a)2e Patterned Preformed Tape (Type B, Class VI) is amended to insert the following:

Only products on Materials Division Approved List 17 which are warranted by the manufacturer against failure resulting from improper installation and material defects when used on Latex Emulsion or other Surface Treatments shall be used on these applications, in conjunction with a low-VOC surface preparation primer adhesive.

The Contractor shall install Type B, Class VI markings on existing asphalt concrete roadway surfaces, hydraulic cement concrete surfaces, and existing or new surface treatment, slurry seal, and latex emulsion surfaces in accordance with the manufacturer's installation instructions for pavement surface preparation, sweeping, and installation techniques for non-embedded (adhesive) surface applications and splicing.

Prior to tape installation on new latex emulsion surfaces:

- The surface shall be swept clear of all loose aggregate immediately prior to spraying the surface preparation primer adhesive.
- The primer adhesive shall be sprayed uniformly at the correct thickness (shall not exceed the maximum thickness specified by the manufacturer), and cured in accordance with the manufacturer's installation instructions.

After application of the surface preparation primer adhesive, the tape shall be tamped to the road using a 200 pound minimum tamper cart and vehicle wheels. The Contractor shall ensure that the vehicle tires, if used, ride true down the length of the tape marking and in accordance with manufacturer instructions.

Section 704.03(d) Pavement Markers is amended to add the following:

Permanent markers shall not be installed until after the installation of the adjacent permanent line marking.

The Contractor may choose to substitute FTPM's in lieu of Type A-temporary paint or in lieu of Type D temporary pavement markings. The Contractor's plan for FTPM's shall be in accordance with the *Typical Plan for FTPM Placement* drawings included herein.

When FTPM's are used to simulate temporary edgelines, then FTPM's shall be spaced every 20 feet and shall match the color of the line markings being simulated.

FTPM's shall be installed at the same locations that permanent pavement markings will be installed.

For surface treatment, slurry seal or latex emulsion treatment operations, the appropriate FTPM's with protective covering shall be installed prior to placing the new treatment. The lens protective covering shall be kept in place during the final surface placement to protect the lens from being obscured or damaged by the paving operation. Upon completion of surface treatment, slurry seal or latex emulsion treatment placement, the Contractor shall remove the protective covering from the reflective lens of the FTPM's prior to leaving the work site. Failure to remove such covering shall result in the non-payment for that portion type (skip or solid) of temporary pavement marking.

For plant mix operations, the appropriate FTPM's shall be installed on the newly-placed pavement after the pavement is thoroughly compacted and has cooled to the FTPM manufacturer's recommended temperature for installation.

The Contractor shall maintain the FTPM's until the permanent pavement markings are installed. Damaged or missing FTPM's shall be replaced within 24 hours of discovery at the Contractor's expense with new FTPM's of the same manufacturing type, color and model. No more than one FTPM may be damaged or missing out of every skip line simulated segment. No two consecutive FTPMs may be damaged or missing on a simulated solid line application, and no more than 30 percent of the FTPM's may be damaged or missing on any measured 100-foot segment of simulated solid line.

Once applied, FTPM's will be considered for a single use. If a FTPM requires replacement, it shall be properly disposed of and replaced with a new FTPM at no additional cost to the Department. FTPM's may remain in place, undamaged, after installation for up to 14 consecutive days. When FTPM's are applied prior to final surface placement (such as with surface treatment, slurry seal, or latex emulsion operations) this 14 -consecutive-day time limit shall begin at the time of actual installation of the FTPM's, not at the time of surface placement. The Engineer may approve an extension of the 14 days if all damaged FTPM's are replaced and the remaining FTPM's are maintained.

FTPM's shall be removed and properly disposed of when permanent pavement markings are installed. Used FTPM's removed from the pavement, including all containers, packaging, damaged FTPM's and all other miscellaneous items of waste, shall be appropriately disposed of in accordance with Section 106.04.

Section 704.03(d)1 Snow-Plowable Raised Pavement Markers is amended to insert the following:

All SRPMs on plant mix surfaces shall be installed within 30 calendar days after the end of the last workday (final surface) of continuous paving on that section of roadway.

All SRPMs on surface treatment, slurry seal, or latex emulsion surfaces shall be installed within 14 calendar days after the final markings are installed, unless a time extension is approved by the Engineer. Time extensions will be granted when weather conditions prohibit installation or other operations on the project would damage the markers. The time limit commences for a continuous section at the end of the last workday that the final surface is placed. For roads with more than two lanes, each direction will be considered a separate continuous section.

Replacement of existing retroreflector lenses shall be in accordance with the manufacturer's installation instructions. If the new retroreflectors are dirtied or damaged during installation they

shall be replaced at no additional cost to the Department. Properly dispose of the existing retroreflectors in accordance with Section 106.04.

Section 704.03(f) Maximum Allowable Time Limits for Unmarked Roads is inserted as follows:

Maximum Allowable Time Limits for Unmarked Roads

Existing markings that are obscured, covered, or eradicated by resurfacing operations (including existing symbol and message markings where the need for temporary symbol or message markings has been identified in the Contract) shall be replaced with either temporary or permanent markings within the time limits established in Table VII-4, unless otherwise approved by the Engineer.

If the Contractor begins the next lift within the time limits specified in Table VII-4 for a non-final surface, then the time limits shall be recalculated as starting at the end of the work day from the time of that next resurfacing operation.

The Engineer may allow the extension of the time limits by up to 12 hours for 10,000 ADT or greater roads, up to 24 hours for 9,999 to 3000 ADT roads, and up to 48 hours for less than 3000 ADT roads, provided that all of the following apply:

- The road is non-limited access.
- The road has a posted or statutory speed limit of 40 mph or below.
- All lanes are delineated by the milled surface or asphalt overlay.
- The road is on tangent alignment.
- “Unmarked Pavement Ahead” or “No Center Line” warning signs were properly installed in accordance with the VWAPM when the unmarked lane was opened to traffic.

For final surfaces, the Contractor shall determine if the permanent markings can be installed within these time limits, based on the installation requirements for that permanent marking material on that type of surface, and the weather conditions. If the permanent markings will not be installed within these time limits, then temporary markings shall be installed.

Table VII-4: Time Limits for Unmarked Roads is inserted as follows:

Table VII-4: Time Limits for Unmarked Roads

Road Type	Maximum allowable duration for unmarked roads
Interstates and other freeways (limited access roads) posted at 55 MPH or greater (including interstate/freeway ramps) ¹	<p>All lane line markings, at a minimum, shall be temporarily or permanently installed before opening the lane to traffic. If the latex emulsion surface has not cured enough to hold the temporary markings (weathered-in texture), then the Contractor shall apply the temporary paint before opening the lane to traffic and then, if necessary and when directed by the Engineer, shall refresh the temporary markings within 24 hours at VDOT expense. -Contractor shall install FTPMs on top of all SRPMs in each lane and gore area with protective covering prior to latex placement in accordance with SP. For covering Cleaning and Inspecting Existing Raised Pavement Markers.</p> <p>All other markings shall be temporarily or permanently installed within 24 hours after the end of the workday when the corresponding existing markings were obscured, removed, or eradicated.</p>

Non-freeway roads with ADT of 10,000 or greater (Traffic Groups XV and above) ^{2,3,4}	All lane line and center line markings shall be temporarily or permanently installed within 24 hours after the end of the workday when the corresponding existing markings were obscured, removed, or eradicated. Application of temporary markings on surface treatment, slurry seal and latex emulsion shall be as soon as the surface has cured enough to hold the temporary markings.
Non-freeway roads with ADT between 3,000 and 9,999 (Traffic Groups XI through XIV)	All lane line and center line markings shall be temporarily or permanently installed within 48 hours after the end of the workday when the corresponding existing markings were obscured, removed, or eradicated.
Non-freeway roads with ADT between 600 and 2,999 (Traffic Groups VII - X) ^{5,6}	All lane line and center line markings shall be temporarily or permanently installed within 72 hours after the end of the workday when the corresponding existing markings were obscured, removed, or eradicated.
Non-freeway roads with ADT less than 600 (Traffic Groups I – VII)	Temporary markings are not required if all “Unmarked Pavement Ahead” or “No Center Line” warning signs were properly installed as per the VWAPM when the unmarked road was first opened to traffic.

¹For the purposes of this Special Provision, freeways shall be defined as any fully limited-access, divided roadway with two or more travel lanes in each direction and 55 mph or greater speed limit.

²If an approach to a signalized intersection has (a) two or more approach through lanes, (b) 45 mph or greater speed limit, (c) greater than 3000 ADT, and (d) all markings on the approach are obliterated, then all lane lines and centerlines within 250 feet of the location of the stop line location shall be temporarily or permanently marked within **24 hours** of opening the approach to traffic, unless a time extension is approved by the Engineer and “Unmarked Pavement Ahead” or “No Center Line” warning signs were properly installed as per the VWAPM when the unmarked approach was first opened to traffic.

³If the Contract Documents require temporary symbol/message markings or temporary edge line markings, those markings shall be temporarily or permanently marked within **72 hours** after the end of the workday when the corresponding existing markings were obscured, removed, or eradicated on non-freeway roads with 10,000 or greater ADT, and **96 hours** on less than 10,000 ADT non-freeway roads, unless the Engineer approves a time extension.

⁴If the next resurfacing operation will obliterate the temporary markings within approximately **24 hours**, the Engineer may approve an extension of time for temporary marking installation if the posted/statutory limit is less than 45 mph, and all “Unmarked Pavement Ahead” or “No Center Line” warning signs were properly installed as per the VWAPM when the unmarked approach was first opened to traffic.

⁵On surface treatment roads with ADT between 1000 and 2999, if it is anticipated that the surface treatment will not be sufficiently cured to permit temporary paint installation within 72 hours, then the Engineer may direct the Contractor to either use yellow FTPMs to simulate the centerline, or to apply temporary pavement markings within 72 hours and then, if the Engineer determines it necessary, refresh those temporary pavement markings with a second application of Type A temporary paint at VDOT’s expense.

⁶On curved portions of surface treatment roads with ADT between 600 and 999, if it is anticipated that the surface treatment will not be sufficiently cured to permit temporary paint installation within 72 hours, then the Engineer may direct the Contractor to use either yellow FTPMs to simulate the centerline on the curves, or to apply temporary pavement markings within 72 hours on the new surface and then, if the Engineer determines it necessary, refresh those temporary pavement markings with a second application of Type A temporary paint at VDOT’s expense. Temporary markings may be omitted on tangent sections of roadway if all “Unmarked Pavement Ahead” or “No Center Line” signs were properly installed as per the VWAPM when the unmarked road was first opened to traffic, and if approved by the Engineer.

Section 704.03(g) Temporary Pavement Markings is inserted as follows:

Temporary Pavement Markings

Premarking, dotting or layout marking shall not be used as a substitute for temporary pavement marking.

Temporary linear, symbol, and message pavement markings specified in the Contract shall be installed at the same locations that the permanent pavement markings are to be installed, unless otherwise approved by the Engineer.

Type D-removable tape shall be installed and removed in accordance with manufacturer's installation instructions.

Type A temporary paint shall be installed in accordance with the manufacturer's installation instructions and as detailed in the following table:

	Milled Surface	Intermediate Lifts or Final Surface
Thickness	15 mils	8 to 10 mils ¹
Glass Bead Application Rate	6 lbs. of glass beads per gallon of material	3 lbs. of glass beads per gallon of material for 8 to 10 mils and 6 lbs. per gallon for 11 to 15 mils
Long Line Width	Same width as the permanent markings	75% of the permanent marking width
Skip Line Pattern	10-foot line segments / 30-foot gaps (approx.)	8-foot line segments / 32-foot gaps (approx.)

¹Type A paint at approximately 15 mils thickness with 6 lbs. of glass beads per gallon will be permitted for the temporary lane line markings provided that the Type A is worn down to no more than 10 mils thickness prior to permanent marking installation. The contractor shall assess how long the temporary lane line, center-line and edge line temporary markings will be in service and may increase the thickness based upon the duration and expected wear.

Temporary Type A pavement markings on final surfaces shall be arranged and spaced so that they will be completely covered by the subsequent installation of permanent pavement markings atop those temporary paint markings.

The following Temporary markings location and placement types shall comply with the following:

- Skip and solid lane line markings shall be required at all locations unless otherwise directed in the Contract.
- Centerline markings shall be required at all locations unless otherwise directed in the Contract. Temporary passing zone changes shall be at the same location as the permanent marking passing zone change locations.
- Edgelines shall only be required where specified in the Contract, subject to the surface reaching a condition to support the markings and the equipment. Temporary edgelines are not required when the shoulder surface is in a milled condition.
- Temporary stop lines, when required by the Contract, shall be 12 inches wide unless otherwise directed.
- Temporary crosswalks, when required by the Contract, shall be two parallel 6-inch white lines unless otherwise directed.

Temporary lane lines, centerlines, and edge lines may be marked with Type D removable tape, Type A-temporary paint, or FTPMs. All temporary symbol and message markings and other types of temporary markings may be marked with Type D-removable tape or Type A-temporary paint.

VTM-94 is not required for temporary pavement marking. However, if the VTM-94 moisture test is not performed, the Contractor shall document the approximate surface wetness on the Form C-85.

If the surface is visibly dry (does not have puddling or free-standing water present), the Contractor is responsible for installing and maintaining the temporary pavement markings. If the Contractor opts not to perform VTM-94 and the temporary markings applied to a visibly dry surface do not sufficiently adhere to the surface, temporary pavement markings shall be reapplied at no additional cost to the Department.

If the surface has puddling or free-standing water present, or if a VTM-94 moisture test result indicates that the condition of the surface is not suitable for temporary pavement marking application, the Engineer may direct the Contractor to install temporary pavement markings on the surface in order to avoid having traffic operate on an unmarked road. In such circumstances the Department may direct the Contractor to install one subsequent reapplication of the temporary markings once the surface has dried, if the previous installation did not satisfactorily adhere to the road. In such circumstances the Contractor will be compensated at the Contract bid price for those temporary markings.

In order to quicken the paint drying process, the Contractor may spray an Engineer-approved drying agent into the traffic paint during installation in accordance with the manufacturer's installation instructions, at no additional cost to the Department.

The Contractor may employ approved methods of drying the pavement surface that will not damage the pavement. Methods that may damage the pavement, such as "torching" of the pavement, will not be allowed. Any drying of pavement will be at no extra cost to the Department.

While in place, temporary pavement markings sizes, shapes and retroreflectivity shall be maintained at adequate visibility and retroreflectivity, as defined in Section 512, until the permanent markings are installed. No additional application (refreshing) is required as long as the temporary markings continue to meet these requirements.

If Type D-removable tape fails the visual evaluation or is deficient in any other respect prior to the installation of permanent markings, the tape shall be removed and new Type D-removable tape, or Type A-temporary paint shall be reapplied, at no additional cost to the Department.

If Type A temporary paint does not meet the requirements of Section 512 prior to the installation of permanent markings, such temporary markings shall be refreshed by the application of a lighter application (applied so as to enhance visibility but not as to require eradication before application of permanent markings) of Type A-temporary markings at the Contractor's expense.

Permanent pavement markings shall not be installed atop Type A temporary markings if the paint is not fully dry or if the paint exceeds the maximum specified thickness in Table VII-3. If the temporary pavement markings are not located directly underneath the location where the permanent markings are to be installed, they shall be 100% eradicated in accordance with Section 512 prior to installation of permanent markings at no additional cost to the Department.

Section 704.03(h) Time Limits for Permanent Pavement Marking Application is inserted as follows:

Time Limits for Permanent Pavement Marking Application

All permanent linear, message, and symbol markings on Interstate and Limited Access Roadways posted at 55 MPH or greater, all other roadways with 10,000 ADT or greater with a

posted or statutory speed limit of 45 mph or greater, shall be placed within the following time limits:

1) For Plant Mix operations:

- a. All Type B Class VI shall be inlaid the same day as the final surface is placed as specified herein.
- b. All other permanent markings shall be completed within 30 days after the end of the last workday of continuous paving on that section of roadway.

2) For Slurry Seal, Latex Emulsion, and Surface Treatment operations:

The contractor shall evaluate the pavement surface between 14 and 18 days after the end of the last workday of continuous paving on that section of roadway. If that evaluation ascertains that the pavement surface meets the markings manufacturer's requirements for application of permanent markings, the texture is weathered-in on the edges, and the temporary marking is worn down to 10 mils or less, then the Engineer shall be notified that the surface meets the markings manufacturer's specifications. The permanent markings shall be installed between 14 days and 30 days after the end of the last workday of continuous paving on that section of roadway.

On all other roadways (non-interstate and non-limited access roads with less than 10,000 ADT, or posted or statutory speed less than 45 MPH), all permanent linear and message or symbol markings shall be installed within 30 days on plant mix surfaces and between 30 and 45 days on surface treatment, slurry seal, and latex emulsion surfaces, after the end of the last workday of continuous paving on that section of roadway.

Permanent markings shall not be installed where pavement curing time or weather conditions prohibit installation, or where the pavement surface does not meet the markings manufacturer's requirements (e.g. the aggregate is not worn-in at the edges).

Any necessary refreshing or replacement of temporary pavement markings or FTPMs will not affect the allowable time limit for completion of permanent pavement marking installation.

Section 704.04—Measurement and Payment is amended to replace the first paragraph with the following:

Pavement line markings will be measured in linear feet and paid for at the contract linear foot price for the type, class and width specified. This price shall include furnishing and installing the pavement marking material, surface preparation, premarking, documentation and staking of existing markings, quality control tests, daily log, guarding devices, primer, adhesive, glass beads, and manufacturer's warranty.

Section 704.04—Measurement and Payment is amended to add the following:

Temporary pavement line markings will be measured in linear feet and paid for at the Contract linear foot price for the type, class, and width specified. This price shall include furnishing, installing, and maintaining the pavement marking materials; surface preparation, inspections, testing, daily log, and guarding devices; providing primer, adhesive, glass beads, and drying agents; and disposal, and removing removable markings when no longer required.

If temporary line markings require refreshing, reapplication, or replacement before the final surface or the permanent markings are installed, all cost for refreshing, reapplication, or replacement shall be at the Contractor's expense, unless the Contractor was directed by the

Engineer to apply the temporary markings to a visibly wet surface or to an insufficiently cured latex emulsion, slurry seal, or surface treatment surface.

In the event the Contractor uses FTPM's in lieu of Type A-temporary paint to simulate a longitudinal line marking as allowed herein, the Contractor will be paid at the linear foot pay unit for the length of simulated line marking at the Type A-temporary paint unit price. That measurement shall represent all FTPM's required for that simulated line marking. This cost shall include furnishing, installing and maintaining the FTPM's, removable covers, surface preparation, quality control tests, daily log, guarding devices, removal, and disposal.

Temporary pavement message (word) markings will be measured in units of each and paid for at the contract each price for the character size, type, and class specified. This price shall include furnishing, installing, and maintaining the pavement marking materials; surface preparation, inspections, testing, daily log, and guarding devices; providing primer or adhesive, glass beads, and drying agents; and disposal, and removing removable markings when no longer required.

Temporary pavement symbol markings will be measured in units of each and paid for at the contract each price for the size, type, and class specified. This price shall include furnishing, installing, and maintaining the pavement marking materials; surface preparation, inspections, testing, daily log, and guarding devices; providing primer or adhesive, glass beads, and drying agents; and disposal, and removing removable markings when no longer required.

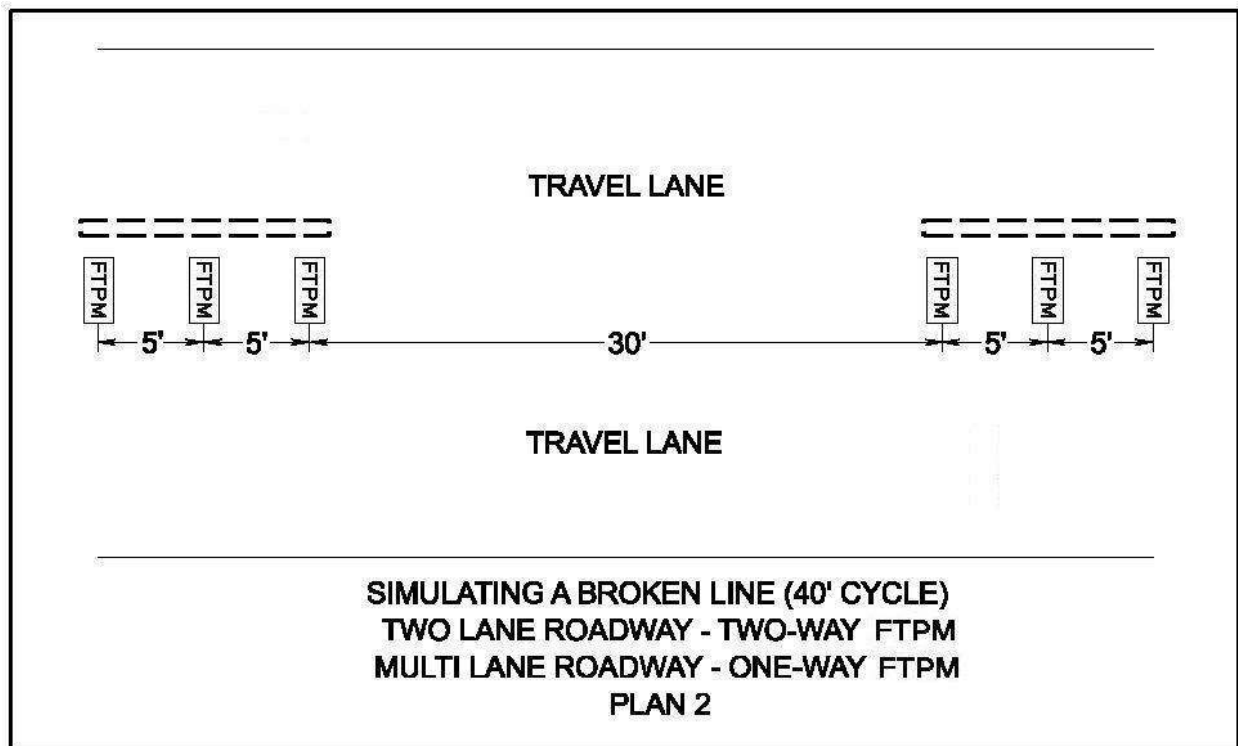
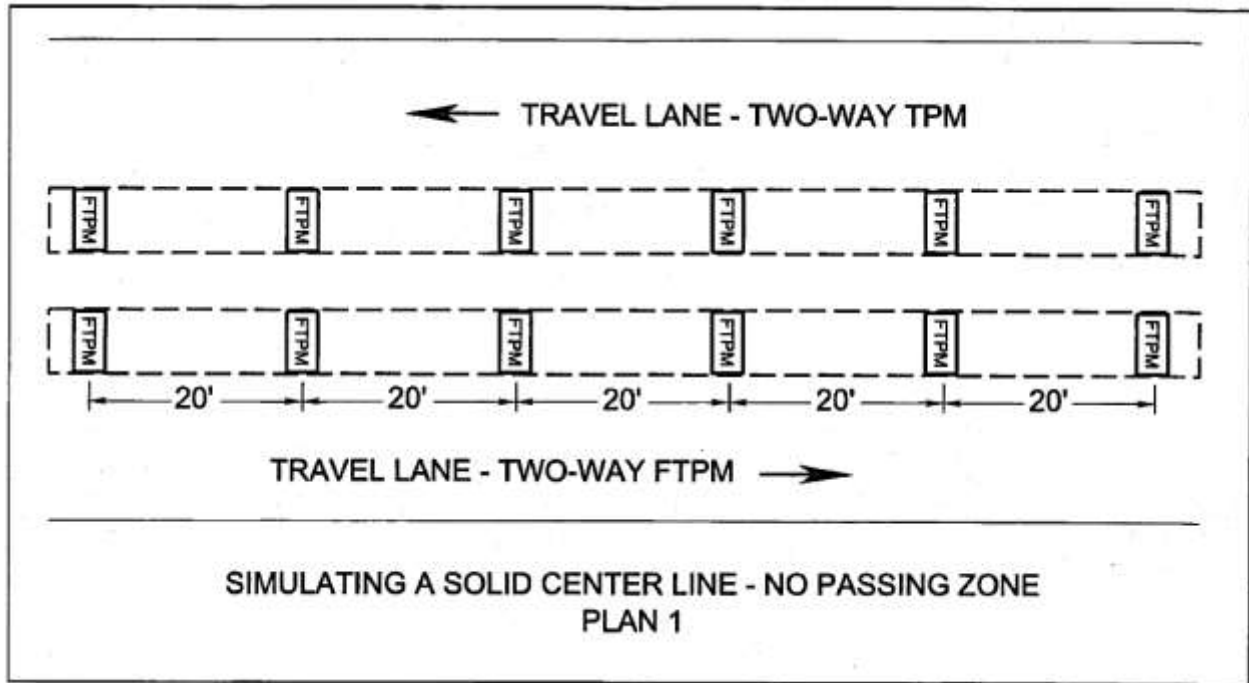
If temporary pavement line, message, or symbol markings require refreshing, reapplication, or replacement before the final surface or the permanent markings are installed, all cost for refreshing, reapplication, or replacement (including Maintenance of Traffic costs) shall be at the Contractor's expense unless the Contractor was directed by the Engineer to apply the temporary markings to a visibly wet surface or to an insufficiently cured latex emulsion, slurry seal, or surface treatment surface.

Pavement Marker Retroreflector Replacement will be measured in units of each and paid for at the contract each price for the type specified. This price shall include furnishing retroreflectors, removal and disposal of the existing retroreflector, cleaning of the existing casting, adhesive, installation of the new retroreflector, quality control tests, daily log, and manufacturer's warranty.

Payment will be made under:

Pay Item	Pay Unit
(Type or class) Temporary pavement line marking (width)	Linear foot
Temporary pavement message (word) marking (size character, type or class material)	Each
Temporary pavement symbol marking (Symbol, Type or class material)	Each
Pavement marker retroreflector replacement (Type)	Each

TYPICAL PLAN FOR FTPM PLACEMENT



GUIDELINES – Plant Mix projects. “Snow-plowable raised pavement markers” are no longer allowed. Use wherever “snow-plowable raised pavement markers” would have been used.

[SP704-000120-00](#)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
INLAID PAVEMENT MARKERS

August 26, 2019

I. Description

This work shall consist of furnishing and installing inlaid pavement markers in accordance with the Contract and manufacturer’s installation instructions. Snow-plowable raised pavement markers conforming to Section 704.03(d)1 of the Specifications shall not be used in the Work.

II. Materials

1. **All components** of the inlaid pavement marker shall be listed on the Department’s Approved List 22.
2. **Retroreflectors** shall conform to ASTM D4383. The color and directional properties (one-way or two-way) of retroreflector lenses shall conform to Standard Drawing PM-8.
3. **HOLDERS** shall be made of polycarbonate plastic that are nominally 4.75 inches wide (excluding breakaway tabs), can hold retroreflectors from the Department’s Approved List 22 under Inlaid Pavement Markers, comes with two breakaway positioning tabs, and will hold the retroreflector just below the pavement surface when installed with the breakaway positioning tabs resting on the pavement surface.

III. Procedure

The Contractor shall furnish the manufacturer’s recommendations for adhesives and installation procedures to the Department before installing the markers.

1. Location and Spacing

The Contractor shall not install markers on bridge decks.

The edge of the groove shall be at least 2 inches from pavement joints and cracks, ensuring that the finished line of markers is straight in accordance with the tolerance for pavement markings specified in Section 704.03 of the Specifications. Offset from the longitudinal joint shall take precedence over straightness of the line of markers.

2. Installation

Retroreflectors shall be affixed to holders, using an adhesive from the Department’s Approved List 22 (Inlaid Pavement Markers) prior to installation.

The Contractor shall cut tapered grooves and plunge cuts into the concrete or final course of asphalt. Grooves and plunge cuts shall be at the dimensions specified in Figure 1, unless

specified otherwise in the manufacturer's installation instructions. The groove length may be shortened to 54 inches on sharp curves if approved by the Engineer.

Tapered grooves and plunge cuts shall be cut using diamond blades that can accurately control the groove dimensions, resulting in smooth uniform tapers and smooth groove bottoms and ensuring the pavement does not tear or ravel. The Contractor shall remove all dirt, grease, oil, loose or unsound layers, and any other material from the groove which would reduce the bond of the adhesive. Pavement surfaces shall be maintained in a clean and dry condition until the marker is placed.

Markers shall be installed in the same shift as grooving.

The epoxy adhesive shall be thoroughly mixed until it is uniform in color, and applied in accordance with the manufacturer's installation instructions. The Contractor shall partially fill the plunge cut with sufficient epoxy adhesive such that the epoxy adhesive bed area is equal to the bottom area of the holder. The Contractor shall then set the holder in the epoxy adhesive such that the breakaway tabs are resting on the road surface, the holder is centered in the cut, and then fill in additional epoxy adhesive if necessary so the entire perimeter of the holder is completely surrounded in epoxy, with the epoxy level with the edge of the holder in accordance with the manufacturer instructions.

The Contractor shall remove all adhesive and foreign matter from the face of the retroreflector or replace the retroreflector if adhesive and foreign matter cannot be removed. The marker shall be replaced if it is not properly positioned and adhered in the plunge cut.

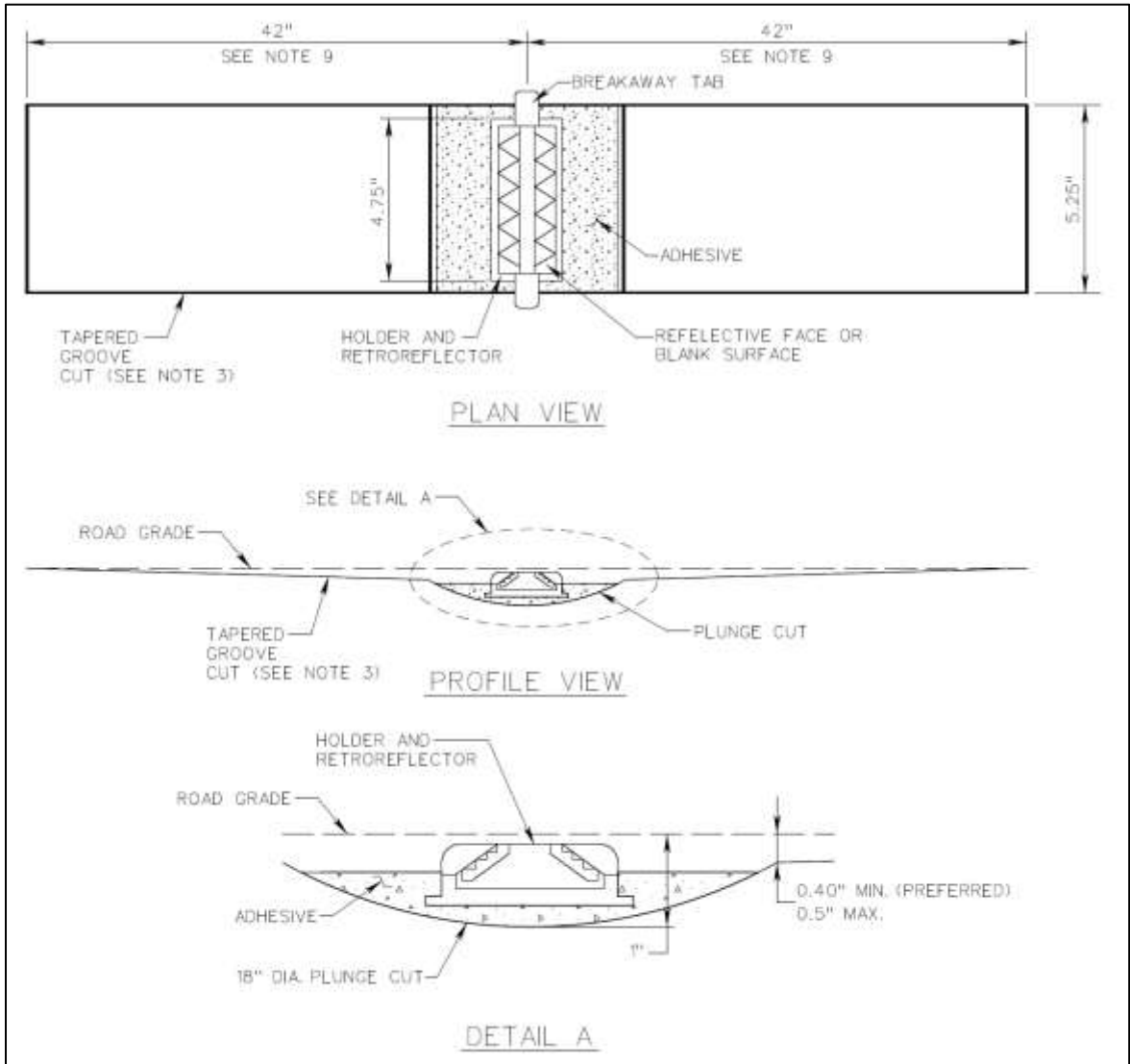


Figure 1: Installation of Inlaid Pavement Marker

IV. Measurement and Payment

Inlaid Pavement Marker will be measured in units of each and will be paid for at the Contract each price. This price shall include surface preparation, furnishing, installing, retroreflectors, pavement cutting, adhesives, and holder.

Payment will be made under:

Pay Item	Pay Unit
Inlaid Pavement Marker (type pavement)	Each

GUIDELINES – A For use on all projects where conventional pole-mounted, wall-mounted, high-mast, or overhead sign lighting luminaires are to be installed. This Special Provision does not cover tunnel lights. If a Luminaire Retrieval System is required on the Plans, a Public Interest Finding is required.

[SP705-000100-00](#)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
LIGHT EMITTING DIODE (LED) LUMINAIRES

July 27, 2018

I. Description

This work shall consist of furnishing and installing LED luminaires for roadway lighting systems (conventional poles, wall mounted, high mast, and overhead sign lighting) not including tunnel lighting, in accordance with this Special Provision, as shown on the Plans, and as directed by the Engineer.

II. General Requirements

The luminaire shall be designed and assembled by the same manufacturer. The luminaire manufacturer shall be ISO 9001 certified or with a documented quality management system of equal stringency and shall have at least five years of experience in manufacturing LED roadway luminaires.

The Independent laboratory used for the luminaire testing shall be on OSHA's current list of Nationally Recognized Testing Laboratories (NRTLs). The testing laboratory shall be located within the continental United States or Canada.

The luminaire shall be UL listed or have a documented quality management system of equal stringency. The luminaire shall be DesignLights Consortium (DLC) listed or Energy Star certified.

III. Materials

All electrical and electronic components of the luminaire shall be compliant with Restriction of Hazardous Substances (RoHS) Directives.

All electrical and electronic components of the luminaire shall meet IEEE C62.41.1, IEEE C62.41.2, and ANSI C136.2 requirements.

The luminaire shall include quick connect/disconnect plugs between separate electrical and electronic components. Wiring within the electrical enclosure shall be NFPA 70/ NEC compliant.

The luminaire shall use a barrier-type terminal block with three line-side wire connectors (including a ground terminal) for power connection to the luminaire. All terminal positions shall be clearly identified. Each connector shall accept only one conductor and accommodate #8 through #12 AWG wire.

The luminaire operating temperature shall include the range of -40°F (-40°C) to 104°F (40°C), with no lumen de-rating from -4°F (-20°C) through 77°F (25°C). The luminaire shall have a passive cooling method (heat sink).

The contact surface between dissimilar metals shall be in accordance to the Section 700 of the Specifications.

1. **Luminaire Housing** shall be constructed of aluminum alloy, die-cast or extruded with minimum shell thickness of 0.050 inches (50 mils). Other materials may be used if proven to have equal or greater strength, ultraviolet and corrosion resistance, and are approved by the Engineer.

Bolts, studs, nuts, set screws, washers, and rivets shall be furnished as commercial items suitable for the application and in accordance with the manufacturer's instructions.

Exposed hardware on the housing including cover and latch shall be stainless steel, zinc, or steel with a zinc alloy electroplate and chromate top coat. Other materials may be used if proven to have equal or greater strength, ultraviolet and corrosion resistance, and are approved by the Engineer.

The housing shall include a corrosion resistant polyester powder coat with a minimum of 2 mil nominal thickness. The finish shall exceed a rating of 8 according to ASTM D1654 after 1000 hours of the salt (fog) testing in accordance with ASTM B117.

If non-metallic materials are used for the housing, the coating may not be required if approved by the Engineer and provided the surface of the housing can demonstrate equal or greater strength, and ultraviolet resistance. The testing procedure shall be in accordance with ASTM G154 or G155.

The housing shall be constructed as one integral piece (with the exception of the high mast luminaire). The electrical and the optical compartment shall not be connected using bolts or any other separable means.

The luminaire housing shall protect the interior against dust, solid objects, and moisture.

The housing shall be designed to allow water shedding and resist the build-up of debris and icicles.

The housing shall have an exterior label stating "LED" and wattage in accordance with ANSI C136.15 and must be visible from the ground.

The housing color shall be gray unless otherwise specified on the Plans.

2. **Optical Assembly** shall be completely sealed and the ingress protection (IP) shall be rated IP66 or higher.

The LED assembly shall have a minimum L70 of 100,000 hours at the specified LED drive current and ambient temperature of 77°F (25°C) based on a minimum of 10,000 hours of data per IES LM-80 and the IES TM-21.

The optical assembly shall have a color rendering index (CRI) of at least 70

Polymer refractive materials shall be UV-inhibited high impact plastic and lens shall be high-impact borosilicate glass or UV-stabilized acrylic. Other materials may be used if proven to have equal or greater strength, ultraviolet and corrosion resistance, and are approved by the Engineer.

3. **Driver** shall be secured inside the housing and suitable for use in wet locations.

The driver shall have a dimming control signal of 0 to 10V in accordance with IEC 60929.

The driver shall be rated for operation and storage within an ambient temperature range of -40°F (-40°C) to 104°F (40°C) of the luminaire.

The driver shall be UL listed and shall meet FCC electrical interference emission and immunity requirements.

The driver shall conform to the following performance requirements:

- Rated life of 100,000 hours minimum at an ambient temperature of 77°F (25°C).
- Power factor of 0.9 or higher, with total harmonic distortion of 20% or less at full load.
- Minimum efficiency of 90% at maximum load and a minimum efficiency of 85% for the driver operating at 50% power
- Accommodate input voltages of 120V – 277V or 347V – 480V.
- Have thermal overload protection mechanism.

4. **Surge Protection Device (SPD)** shall be an integral part of the luminaire and the LED power supply. The SPD shall be Type 4 in accordance with UL 1449.

The SPD shall be rated at minimum 10KV/5KA surge level.

The SPD shall operate with no performance degradation within an ambient temperature range of -40°F (-40°C) to 104°F (40°C) of the luminaire, 0-95% Relative Humidity (RH), non-condensing.

5. **Warranty**

The luminaire shall be warranted by the manufacturer for a minimum of 10 years from date of installation against any failure resulting from materials, and defects.

Failure is defined as one or more of the following:

- Significant light output reduction from more than 10% of the LED packages
- Moisture inside the optical assembly
- Lens discoloration
- Driver failure
- Presence of other conditions that do not meet specifications.

6. **Additional criteria** shall be applied to specific type of luminaires as indicated below:

A. **Conventional Pole-mounted Luminaire**

- (1) Shall have a system efficacy of at least 100 lumens/watt.

- (2) Weight shall not exceed 50 pounds.
- (3) Effective projected area (EPA) of maximum 3 square feet.
- (4) Shall conform to the requirements of ANSI C136.31 for vibration and be rated at least 3G.
- (5) The optical assembly shall be rated correlated color temperature (CCT) of 3000 or 4000 Kelvin (K) in accordance with ANSI C136.37.
- (6) Shall include a prewired 7-pin twist lock ANSI C136.41-compliant receptacle and a rain-tight shorting cap.
- (7) Shall be designed to slip-fit onto a nominal 2-inches inside diameter or 2-3/8-inches outside diameter tenon and allow for an insertion of at least 3-1/2 inches, with internal barrier preventing over-insertion of the tenon.
- (8) Shall include clamp with minimum four appropriate size bolts in accordance with the manufacturer's instructions, unless otherwise directed by the Engineer.
- (9) Shall include a leveling device for horizontal or vertical orientation.
- (10) The housing shall include a door that is easy to open and close, or remove and replace without requiring any tool.

B. Wall mounted Luminaire

- (1) Shall have a system efficacy of at least 70 lumens/watt.
- (2) Weight shall not exceed 30 pounds.
- (3) Conform to the requirements of ANSI C136.31 for vibration and be rated at least 1.5G
- (4) The optical assembly shall be rated CCT of 3000K or 4000K in accordance with ANSI C136.37.
- (5) Shall be equipped with 0 to 10V field-adjustable output module for dimming capabilities if required on the Plans or directed by the Engineer.
- (6) Shall be designed such that it can be mounted onto a vertical flat surface by means of at least three appropriate size bolts with approved chemical or mechanical anchors through the wall side of the housing, in accordance with the manufacturer's instructions, unless otherwise directed by the Engineer.
- (7) Shall include a wire entry for the incoming power on the top, bottom, back, or vertical sides as required on the Plans. Each entry shall be pre-manufactured and tapped for a standard conduit connection. Unused entries shall be properly closed with screw type plugs supplied by the manufacturer.
- (8) The housing shall include a door that is easy to open and close, or remove and replace without requiring any tool.

C. High Mast Luminaire

- (1) Shall have a system efficacy of at least 100 lumens/watt.
- (2) Weight shall not exceed 70 pounds.
- (3) EPA of maximum 3.1 square feet.
- (4) Conform to the requirements of ANSI C136.31 for vibration and be rated at least 3G
- (5) The optical assembly shall have a rated CCT of 3000K or 4000K in accordance with ANSI C136.37.
- (6) Shall include a prewired 7-pin twist lock ANSI C136.41 compliant receptacle and a rain-tight shorting cap.
- (7) Shall be adjustable and designed to slip-fit onto a mast arm mount from a nominal 1-1/4-inches to 2-inches inside diameter and 1-5/8-inches to 2-3/8-inches outside diameter tenon and allow for an insertion of at least 3-1/2 inches, with an internal barrier preventing over insertion of the tenon.
- (8) Shall include clamp with at least four bolts specified by the manufacturer unless otherwise directed by the Engineer.
- (9) The housing shall include a door that is easy to open and close, or remove and replace. The door may require a basic tool (such as a flat-tip or phillips screwdriver) to open and close.

D. Overhead Sign Lighting Luminaire

- (1) Shall have a system efficacy of at least 70 lumens/watt.
- (2) Weight shall not exceed 30 pounds.
- (3) EPA of maximum 0.75 square feet.
- (4) Conform to the requirements of ANSI C136.31 for vibration and be rated minimum 3G
- (5) The optical assembly shall be rated CCT of 3000K in accordance with ANSI C136.37.
- (6) Shall be equipped with 0 to 10V field-adjustable output module for dimming capabilities if required on the Plans or directed by the Engineer.
- (7) Shall be designed such that it can be installed onto one of the following types (as per the Standard Drawing OSS-1):
 - Retrieval system
 - Mounting Bracket
- (8) The housing shall include a door that is easy to open and close, or remove and replace without requiring any tool.

IV. Procedures

The Contractor shall securely install the luminaires at locations designated on the Plans, in accordance with the manufacturer's instructions.

Overhead sign lighting luminaires shall be installed as per the Standard Drawing OSS-1. If indicated on the Plans, the sign lighting luminaires shall be mounted on luminaire retrieval systems. The Contractor shall demonstrate the functionality of the luminaire retrieval system in the presence of the Inspector. Sign lighting luminaires to be installed without a luminaire retrieval system shall be attached to luminaire mounting brackets.

High mast luminaire and ring assemblies shall be installed and tested in accordance with Section 705. High mast luminaires shall be rotated to maximize illumination on the road and minimize illumination outside the right-of-way, as indicated on the Plans and as directed by the Engineer.

The Contractor shall perform testing of the electrical components in accordance with Section 705 of the Specifications.

V. Measurement and Payment

Conventional luminaire will be measured in units of each and will be paid for at the Contract unit price for the wattage and type specified. This price shall include the luminaire housing, slipfitter, optical assembly, drivers, terminal block, surge protection device, labeling, conductor cables to the termini at the base of the pole or junction box, 7-pin receptacle with shorting cap, photo electric control, adjustments, testing, warranty, and incidental hardware to complete the work.

Wall-mounted luminaire will be measured in units of each and will be paid for at the Contract unit price for the wattage and type specified. This price shall include the luminaire housing, mounting hardware, optical assembly, drivers, terminal block, surge protection device, labeling, conduit, conductor cables to the termini at the junction box, adjustments, testing, warranty, and incidental hardware to complete the work.

High mast luminaire will be measured in units of each and will be paid for at the Contract unit price for the wattage and type specified. This price shall include the luminaire housing, slipfitter, optical assembly, drivers, terminal block, surge protection device, labeling, conductor cables to the termini at the base of the pole or junction box, 7-pin receptacle with shorting cap, photoelectric control, adjustments, testing, warranty, and incidental hardware to complete the work.

High Mast Ring Assembly will be measured in units of each and will be paid for at the contract unit price for the number of luminaires to be installed at that location. This price shall include the luminaire ring, lowering device with head frame and assembly, winch assembly, electric drills, electric raise/lower unit, lowering cables, junction box with prewired terminal block, adjustments, testing and incidental hardware to complete the work.

Sign lighting luminaire will be measured in units of each and will be paid for at the Contract unit price for the wattage and type specified. This price shall include the luminaire housing, mounting hardware, optical assembly, drivers, terminal block, surge protection device, labeling, conduit, conductor cables to the termini at the safety switch or junction box at the base of the structure, 7-pin receptacle with shorting cap, photoelectric control, service entrance head, grounding lug, safety switch, contactor, adjustments, testing, warranty, and incidental hardware to complete the work.

Electrical service, if required, shall be measured in accordance with Section 700 of the Specifications.

Luminaire retrieval systems will be measured in units of each and will be paid for at the Contract unit price per each. This price shall include the luminaire retrieval system, adjustment, and testing.

Payment will be made under:

Pay Item	Pay Unit
Conventional luminaire (wattage and type)	Each
Wall mounted luminaire (wattage and type)	Each
High mast luminaire (wattage and type)	Each
High mast ring assembly (number of luminaires)	Each
Sign lighting luminaire (wattage and type)	Each
Luminaire retrieval system (structure)	Each

SQ704-000100-00

GUIDELINES – For projects where the final pavement markings will be installed by the Department or by other contracts.{2007-SU704001A}

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
PAVEMENT DOTTING

October 8, 2008; Reissued July 12, 2016_

I. DESCRIPTION

This work shall consist of the furnishing and placing of pavement dots to establish the location of pavement markings on the roadway according to the requirements specified herein and as directed by the Engineer. This work is for those sections of roadways where the final pavement markings will be installed by the Department or by other contracts. Those sections of roadways where the Contractor installs the final pavement markings shall not require pavement dotting, however, premarking may be accomplished at the Contractor's option according to Section 704.03 of the Specifications.

II. MATERIALS

Pavement dots shall be removable tape (Type D, Class II) conforming to Section 246.03(g)1 of the Specifications. Pavement dots shall consist of 4-inch by 4-inch squares or 4-inch diameter circles and shall be of the same color as the final pavement markings to be installed.

III. PROCEDURES

Pavement dots shall be placed on the new pavement surface for each individual pavement marking line unless otherwise directed by the Engineer. Pavement dots shall be placed in the same lateral position along the roadway where the existing markings were located.

Pavement dots shall be installed at 100-foot intervals in tangent sections and 50-foot intervals in curved sections. Less spacing may be used as needed for but not limited to such pavement markings items as stop lines, crosswalk lines, and hatching. Pavement dotting shall be installed according to the manufacturer's recommendation.

IV. MEASUREMENT AND PAYMENT

Pavement dotting will be measured and paid for at the contract unit price per mile of pavement line dotted, to the nearest one-tenth of a mile. This price shall be full compensation for furnishing and installing the pavement dots, and all materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Pavement dotting	Mile

Included in the [2019 Supplement to the 2016 Specifications page 74](#)

[SS700-002016-03](#)

June 29, 2018

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 700—GENERAL

SECTION 700—GENERAL of the Specifications is amended as follows:

Section 700.02(a) Concrete is replaced with the following:

Concrete shall be Class A3 conforming to Section 217.

Section 700.02(c) Dissimilar metals is replaced with the following:

Dissimilar metals - The contact surfaces between dissimilar metals shall be isolated with an approved durable nylon washer, gasket, or other approved isolation material to prevent corrosion, except that isolation material shall not be used in conjunction with mast arm hanger assemblies, nor shall isolation materials be used on square tube post structures.

Section 700.02(g) Steel for structural support of light poles and traffic control devices is replaced with the following:

Steel for structural support of light poles and traffic control devices shall conform to Section 226 and shall be fabricated, welded, and inspected in accordance with Section 407 unless otherwise noted.

Section 700.02(j) Breakaway support systems is replaced with the following:

Breakaway support systems, including breakaway transformer bases, shall conform to National Cooperative Highway Research Program (NCHRP) Report 350 or Manual for Assessing Safety Hardware (MASH) testing requirements. The Contractor shall provide a copy of the MASH or FHWA certification letter for the brands and models of breakaway systems planned for use.

Breakaway couplers will not be permitted.

The following shall be used when breakaway support systems are specified on the plans:

1. **Frangible bases** shall be aluminum.
2. **Slip bases** shall be galvanized steel or other approved noncorrosive metal.

Section 700.03 General Requirements is replaced with the following:

Cable wiring holes in traffic control device and ITS device structures shall be deburred and rounded, or fitted with a grommet. Damaged galvanization shall be repaired in accordance with Section 233. The size of the hole shall not exceed the sum of the diameter of the cables plus 1/2-inch.

The design of traffic control device and ITS device structures and foundations shall conform to AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaries, and*

Traffic Signals, 6th Edition (LTS-6), 2013 with 2015 interims, as modified elsewhere in the Contract.

In addition, structures and foundations shall be designed as per the following:

(a) **Sign Structures:**

Overhead Sign and Dynamic Message Sign (DMS) Structures (Span, Cantilever, Butterfly, etc.) shall be fabricated from galvanized steel material as specified herein. Aluminum structures will not be allowed. Base plates for overhead sign structures shall have at least the minimum number and diameter of anchor bolts specified in the Standard Drawings. Washers are required above and below the base plate. Tubular pole shafts shall have a removable cap fastened by at least three screws.

Ground Mounted Sign Structures shall be fabricated from galvanized steel unless otherwise indicated. Square tube posts shall conform to ASTM A1011, Grade 50 except the yield strength after cold-forming shall be 60,000 psi minimum for 12 and 14 gauge posts, and 55,000 psi minimum for 10 gauge posts. Posts (inside and outside) shall be galvanized in accordance with ASTM A653, Coating Designation G-90. Square tube sign posts that are 2.5 inches or less shall have 7/16-inch (\pm 1/64-inch) openings or knockouts spaced 1-inch on centers on all four sides.

(b) **Lighting Structures** shall be of a one-piece or sectional single unit, tubular form, and shall be round or multisided. Multisided poles shall have at least eight sides. Pole shafts shall have a removable cap fastened by at least three screws.

1. **High Mast Lighting Structures** (Lengths of 55 feet or greater) shall be galvanized steel and shall have at least the minimum number and diameter of anchor bolts specified in the Standard Drawings. Aluminum structures will not be allowed. Washers are required above and below the base plate.

2. **Conventional Lighting Structures** (Lengths less than 55 feet) shall be galvanized steel or aluminum and shall have at least the minimum number and diameter of anchor bolts specified in the Standard Drawings.

(c) **Signal Poles and Mast Arms** shall be galvanized steel of a one-piece or sectional single unit, tubular form, and shall be round or multisided. Multisided poles shall have at least eight sides. Pole shafts and mast arms shall have a removable cap fastened by at least three screws. If field adjusting of mast arm length is required, the end cap shall snugly fit the arm after adjustment

1. **Mast Arm Signal Poles:** The mast arms shall not deflect below the horizontal plane or below the minimum vertical clearance after the Standard Drawing MP-3 maximum loads are applied.

The flange plate and pole shall have a 4 inch wiring hole centered in the pattern that is deburred and rounded or fitted with a grommet. Mast arms shall be secured to the pole with thru-bolt, nuts, and washer connections. The flange plate shall be continuously welded to gusset and side plates. Gusset and side plates shall be continuously welded to the pole and each other. The flange plate shall be parallel to the axis of the pole. Flange plates for mast arm poles with two arms shall be positioned 90 degrees to each other. The flange plate shall be designed to receive a minimum of eight 1.5-inch diameter bolts for attachment of the arm.

Foundations for mast arm signal poles shall be designed in accordance with Standard Drawing PF-8 for the specified pole length and mast arm length shown on the Plans. Foundations shall also be designed for the greater of either the mast arm loadings and placement of loads shown on the Plans, or the Standard Drawing MP-3 design loadings for that arm length.

Mast arm poles shall have a round base plate and at least the minimum number of anchor bolts specified in the Standard Drawings. Washers are required above and below the base plate.

Mast arm pole types shall be in accordance with the following table. The poles shall be designed to support the maximum design loading allowed for that pole type, in accordance with the following table and Standard Drawing MP-3. The arms shall be designed to support the maximum design loading allowed for that mast arm length depicted in Standard Drawing MP-3.

Pole Type	# of arms	MP-3 Maximum Allowable Loading	Luminaire arm	Pole Length(top of pole to bottom of base plate)
A	1	49 ft Loading Standard	No	19
B1	1	75 ft Case 1 Loading Standard	No	19
B2	1	75 ft Case 2 Loading Standard	No	19
C	2 (mounted at 90° to each other)	70 ft Loading Standard & 60 ft Loading Standard	No	19
D	1	49 ft Loading Standard	Yes	25
E1	1	75 ft Case 1 Loading Standard	Yes	25
E2	1	75 ft Case 2 Loading Standard	Yes	25
F	2 (mounted at 90° to each other)	70 ft Loading Standard & 60 ft Loading Standard	Yes	25

Mast arms and poles shall be designed such that arm lengths greater than 49 feet in length cannot be mated to Type A or Type D poles. Mast arms shall not be attached to poles that have not been designed to support that length of mast arm.

Type D, E1, E2, and F poles, and the foundations for those poles, shall also be designed to support a maximum 18' luminaire arm supporting a 22-pound video camera with 1 square foot of wind load area concentrated 1 foot from the end of arm, and a 35-pound luminaire with 1 square foot of wind load area located at the end of the arm.

2. **Strain Signal Poles** shall be erected on foundations designed in accordance with Standard Drawing PF-8. They shall have a round base plate designed for at least the minimum number and diameter of anchor bolts specified in Standard Drawing PF-8. Washers are required above and below the base plate. The structure and the foundation shall be designed for the loads shown on the plans. Strain signal poles shall be field

drilled for the attachment of span wire and tether wire. Span wire shall be attached at least 18 inches below the top of the pole. All loads shall be assumed to be tethered and no load reduction for breaking of the tether wire shall be used in the pole design.

3. **Pedestal Signal Poles** shall be aluminum 6061-T6 structural tubes with minimum 0.337-inch wall thickness.
- (d) **Luminaire arms** shall be manufactured of the same material (aluminum or galvanized steel) as the supporting structure.
- (e) **Camera Poles** for the support of ITS equipment shall be galvanized steel of a one-piece or sectional single unit, tubular form, and shall be round or multisided. Multisided poles shall have at least eight sides. They shall have at least four anchor bolts.
- (f) **Remove Existing Sign Panels or Sign Structures:** Removed materials shall be disposed of in accordance with Section 106.04.

All foundations shall be removed to a point at least 2 feet below finished grade. The Contractor shall fill and compact the resulting cavities, and restore the area with topsoil, grading, seed, fertilizer, or lime as necessary.

All new signs in a particular sequence giving similar directions shall be installed before existing signs are removed.

Where a sign support is located on a bridge structure, or other such structure where the foundation cannot be removed, the existing anchor bolts shall be cut flush with the top of the structure and sealed with a two-part epoxy resin to prevent the remaining bolts from corroding.

When an overhead sign structure is attached to a bridge parapet, the existing anchor bolts shall be mechanically cut flush with the surface of the parapet, removed by mechanical drilling to a depth of one-half inch below the surface of the parapet, and patched to match the color and texture of the existing parapet surface with hydraulic cement mortar or grout in accordance with Section 410. Connection bolts to the steel beams shall be removed and voids shall be filled as directed by the Engineer.

When an existing sign structure being removed has lights or beacons, the electrical service shall be disengaged at the nearest junction box, and all conductors shall be capped and sealed in place unless service is to be reused for electrical service for a replacement structure.

When an existing sign panel is being removed in order to facilitate its replacement with a new sign panel, the existing sign panel shall be removed immediately before installing the new sign panel unless otherwise directed by the Engineer.

When an existing sign structure is being replaced with a new sign structure, then continuity of signing shall be maintained by erecting the new sign structure immediately behind the existing sign structure prior to removing the existing sign structure unless otherwise directed in the Plans or by the Engineer.

- (g) **Relocate Existing Sign Panels:** Sign panels designated for relocation shall be removed from their existing locations and reinstalled at the locations indicated in the Contract. Existing framing and bracing members shall be reused at the new sign location unless otherwise directed by the Engineer.

Sign panels shall be reinstalled immediately following removal from their existing location, unless otherwise approved by the Engineer.

Sign panels shall be attached to their new location using new attachment hardware in accordance with the Standard Drawings and the Specifications.

Any sign panels that are scratched or damaged during the relocation process shall be replaced at no additional cost to the Department.

Section 700.04 Working Drawings is amended to replace the last paragraph with the following:

A Professional Engineer licensed to practice engineering in the Commonwealth of Virginia shall verify that the proposed traffic control device or ITS device foundations and structures are designed in accordance with the Plans, Specifications, Standard Drawings, and the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, 6th Edition (LTS-6), 2013 with 2015 interim*, as modified elsewhere in the Contract and address site conditions, loadings shown on the plans, maximum design loadings in the Standard Drawings and Contract, and required vertical clearances.

Section 700.05(c) Concrete Foundations is amended to replace the seventh paragraph with the following:

The Contractor shall furnish the foundation designs for signal poles, high-mast lighting poles, overhead sign structures, and camera poles to the Engineer for review. Such designs shall be supervised and sealed by a Professional Engineer licensed to practice engineering in the Commonwealth of Virginia. Design calculations and drawings shall indicate the cubic yard quantity of concrete required to construct the foundations. The foundations shall be designed for the structure it is supporting and for the loads the structure is being designed to support, unless indicated otherwise on the plans.

Section 700.05(c) Concrete Foundations is amended to replace the eleventh and twelfth paragraphs with the following:

Test bores in Bristol, Salem, Lynchburg, Staunton, and Culpeper Districts shall be performed within 5 feet of the proposed foundation's location as shown on the plans or as directed by the Engineer. Test bores in Richmond, Hampton Roads, Fredericksburg, and Northern Virginia Districts shall be performed within 10 feet of the proposed foundation's location as shown on the plans or as directed by the Engineer.

The Contractor shall place vented varmint screens in accordance with Standard Drawing VS-1 inside the bolt circle of signal mast arm pole, signal strain pole, high mast light pole, overhead sign structure, ITS device support pole, and lighting pole foundations. Vented varmint screens shall not be used for structures on transformer bases, unless the transformer base is raised above the surface of the foundation with leveling nuts.

Section 700.05(d) Electrical Service is amended to replace the second and third paragraph with the following:

When required on the Standard Drawings, the Plans, or as directed by the Engineer, the Contractor shall construct an electrical service work pad in front of all electrical service safety switches, breaker boxes, and pole mounted cabinets, except when an immediately adjacent paved sidewalk can fulfill this purpose. The electrical service work pad shall be at least 20 inches in width, 36 inches in length, and 4 inches in depth, and sloped to facilitate drainage away from the structure. Exposed concrete areas of electrical service work pads shall be given a Class 7 finish in accordance with Section 404 of the Specifications.

Section 700.05(e) Poles, posts, sign structures, and ITS structures is amended to replace the fifth paragraph with the following:

All signal poles, light poles not mounted on transformer bases, camera poles, and overhead sign structures shall be provided with handholes that are on the side opposite traffic. Handholes shall be at least 3 by 5 inches, unless otherwise specified in the Standard Drawings, and shall be provided with a weatherproof gasket and cover. Handholes shall be latchable and capable of being opened using a star wrench or other approved latching mechanism. If specified in the Contract, a lockable handhole cover shall be provided, using key requirements provided by the VDOT Regional Operations Maintenance Manager.

For structures mounted on transformer bases, the transformer bases shall have hinged access covers on the side opposite traffic, unless specified otherwise in the Standard Drawings. The Contractor shall furnish the Engineer with at least one tool or key required to open handholes and transformer base access covers for each 40 structures or fraction thereof.

Section 700.05(f) Breakaway Support Systems is renamed **Transformer Bases** and replaced with the following:

Transformer Bases: Pedestal poles that do not support electrical power service equipment shall be installed atop breakaway transformer bases. Pedestal poles that support electrical power service equipment shall be installed atop non-breakaway transformer bases. Lighting poles, except high-mast lighting poles, shall be installed on the type of transformer base (breakaway or non-breakaway) specified on the Plans.

Section 700.05(k) Anchor Bolts is replaced with the following:

Anchor Bolts: Foundations for traffic control device structures (signal poles, overhead sign, lane control, variable message signs, camera poles, and high-mast lighting structures) shall have a bolt template positioned to correctly orient the structure with respect to the structure's location and roadway alignment and to maintain the anchor bolts vertical (plumb) and level during construction.

A minimum of three nuts and two hardened washers shall be provided for each anchor bolt.

Bolt or anchor nut covers shall not be installed on any traffic control device structures, unless otherwise specified on the plans.

Anchor bolts in double-nut connections shall extend a minimum of 1/4 inch past the second top nut.

Double-nut connections installation procedures shall be completed on upright members before installing associated elements, and shall conform to the following:

1. If anchor bolts are not plumb (vertical), determine if beveled washers may be required prior to erecting the structure. Beveled washers shall be used on top of the leveling nut or under the first top nut if any face of the base plate has a slope greater than 1:20 and if any nut could not be brought in firm contact with the base plate.
2. Clean and then lubricate the exposed thread of all anchor bolts, nuts, and bearing surfaces of all leveling nuts with beeswax, the bolt manufacturer's recommended lubricant, or other lubricant as approved by the Engineer before installing the structure. Re-lubricate the exposed threads of the anchor bolts and the threads of the nuts if more than 24 hours has

elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

3. Verify that the nuts can be turned onto the bolts the full length of the threads by hand.
4. Turn the leveling nuts onto the anchor bolts and align the nuts to the required elevation shown on the shop drawings. The maximum distance between the bottom of the leveling nut and the top of the foundation shall be 1 inch.
5. Place structural hardened washers on top of the leveling nuts (one washer corresponding to each anchor bolt).
6. The post or end frame shall be plumbed or aligned as shown on the shop drawings. The maximum space between the bottom of the base plate and the top of the foundation shall be the diameter of the anchor bolt plus 1 inch. Place structural hardened washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the first top nuts onto the anchor bolts.
7. Tighten first top nuts to a “snug-tight” condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12-inch long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.
8. Tighten bottom leveling nuts to a snug-tight condition in a star pattern.
9. At this point, verify again if beveled washers are necessary using the step 1 criteria. If beveled washers are required, remove the structure if necessary, add the beveled washers, and retighten first top nuts and bottom leveling nuts (in a star pattern) to a snug-tight condition.
10. Mark the reference position of each first top nut in a snug-tight condition with a suitable method on one flat surface of the nut with a corresponding reference mark on the base plate at each bolt before final tightening of the first top nuts. Then rotate the first top nuts incrementally to one half the required nut rotation specified in Table VII-1 using a star pattern. Rotate the first top nuts again, using a star pattern, to the full required nut rotation specified in Table VII-1. For example, if total rotation from snug tight is 1/6 turn (60°), rotate 30° in each cycle.

Neither lock nuts nor split washers shall be used with anchor bolts.

11. The Contractor shall inspect tightened anchor bolt connections by the use of a calibrated torque wrench in the presence of the Engineer. The torque wrench shall be used to verify that a torque at least equal to the verification torque provided in Table VII-2 has been achieved. The maximum nut rotation in step 10 shall not be exceeded. A minimum of every other bolt shall be inspected.
12. Install second top nut on each bolt to the snug tight condition.

After all prior steps are completed and all elements of the structure are fully erected, the Contractor shall perform an ultrasonic test on all anchor bolts in accordance with ASTM E114 - Ultrasonic Pulse Echo Straight Beam Testing by the Contact Method. Ultrasonic testing personnel shall be qualified in accordance with ASNT SNT-TC-1A Level II and certified by the VDOT Materials Division. Equipment shall be qualified in accordance with AWS D1.5 Section 6, Part C. Anchor bolts shall have no indications that are above 10% Full Screen Height at the prescribed scanning level. All indications shall be noted on the test report and

submitted to the Engineer and the State Materials Engineer. A copy of the report, for both structures with and without indications, shall be submitted to the District Bridge Office and the Engineer.

Table VII-1 – Nut Rotation is replaced with the following:

**TABLE VII-1
Nut Rotation**

Anchor Bolt Diameter, (in.)	Nut Rotation beyond Snug-Tight	
	ASTM F 1554 Grade 36 (M314)	ASTM F 1554 Grade 55 (M314)
	≤1½	1/6 turn (60°)
>1½	1/12 turn (30°)	1/6 turn (60°)

Nut rotation is relative to anchor bolt. Anchor bolt nut tensioning shall not exceed plus 20°. Unified Thread Standard (UNC) tensioning is applicable.

Table VII-2 – Torque Verification is replaced with the following:

**TABLE VII-2
Torque Verification**

Anchor Bolt Diameter, (in.)	Verification Torque	
	ASTM F 1554 - Grade 36 (M314) Tension/Torque kips/ft-lbs	ASTM F 1554 - Grade 55 (M314) Tension/Torque kips/ft-lbs
	1	18 / 180
1 1/4	28 / 350	44 / 550
1 1/2	41 / 615	63 / 945
1 3/4	55 / 962	86 / 1,505
2	73 / 1,460	113 / 2,260
2 1/4	94 / 2,115	146 / 3,285
2 1/2	116 / 2,900	180 / 4,500
2 3/4	143 / 3,932	222 / 6,105
3	173 / 5,190	269 / 8,070
3 1/4	206 / 6,695	320 / 10,400
3 1/2	242 / 8,470	375 / 13,125
3 3/4	280 / 10,500	435 / 16,312
4	321 / 12,840	499 / 19,960

Section 700.06 Measurement and Payment is amended to replace the first paragraph with the following:

Concrete foundations will be measured units of each or cubic yards and will be paid for at the Contract each or cubic yard price of concrete as applicable for the standard, type and size designated. When paid for in cubic yards of concrete, no payment will be made for concrete in excess of the cubic yards of concrete required by the approved foundation design unless otherwise authorized by the Engineer, in which case the additional concrete will be paid for in cubic yards for the invoice material cost only. This price shall include providing foundation design and shop drawings; concrete, reinforcing steel, anchor bolts, washers, nuts, bolt circle templates, lubricant, torque, ultrasonic test on anchor bolts, grounding electrodes (including grounding electrode clamps, grounding electrode conductors, and installation), conduits, testing grounding conductor-to-electrode continuity, excavating, backfilling, compacting, vented varmint screens, disposing of surplus and unsuitable material, and restoring disturbed areas.

Section 700.06 Measurement and Payment is amended to replace the ninth through the thirteenth paragraph with the following:

Lighting poles will be measured in units of each and will be paid for at the Contract each price for the standard and luminaire mounting height or type specified. This price shall include providing design and shop drawings; pole shafts, grounding lugs, handholes, locks (when required), caps, identification tags, base plates, vibration dampeners (when required), transformer bases, field drilling, and galvanization.

Steel strain poles will be measured in units of each and will be paid for at the Contract each price for the length specified. This price shall include providing design and shop drawings, pole shafts, J-hooks, grounding lugs, handholes, locks (when required), caps, fittings, identification tags, field drilling, and galvanization.

Mast arm signal poles will be measured in units of each and will be paid for at the Contract each price for the standard and type specified. This price shall include providing design and shop drawings, pole shafts, J-hooks, grounding lugs, handholes, locks (when required), caps, fittings, base plates, identification tags, field drilling, and galvanization.

Mast arms will be measured in units of each and will be paid for at the Contract each price for the length and loading case (when required) specified. This price shall include providing design and shop drawings, mast arms including mast arms caps, galvanization, fittings, nuts, bolts, washers, field drilling of wire outlet holes and rubber gaskets or grommets, field adjustment of arm lengths, and identification tags.

Overhead sign structures will be measured in units of each and will be paid for at the Contract each price for the location specified. This price shall include furnishing design and shop drawings, structural units and supports, field drilling and adjustment, galvanization, base plates, handholes, locks (when required), caps, grounding lugs, electrical systems including conduit, sign luminaires, luminaire supports, fittings, conductor cable, and identification tags.

Sign posts will be measured in linear feet and will be paid for at the Contract linear foot price for the type and size specified. This price shall include clamps, hinge assemblies, and identification tags when required.

Section 700.06 Measurement and Payment is amended to replace the sixteenth paragraph with the following:

Pedestal poles will be measured in units of each and will be paid for at the Contract each price for the standard and length specified. This price shall include caps, transformer bases, access covers, galvanization, grounding lugs, and identification tags.

Section 700.06 Measurement and Payment is amended to insert the following:

Remove Existing (Type) Sign Structure will be measured in units of each and will be paid for at the Contract each price for the type of structure specified. This price shall include removing and disposing of the existing sign structure and all supported sign panels, conduits, cables, lights, luminaires, and luminaire retrieval system attached to the structure; disengaging existing electrical service; and capping and sealing conductors. This price shall also include excavating, demolishing, and removing foundational elements to at least two feet below ground line; capping and sealing conduit with hydraulic cement mortar or grout, and epoxy resin; disposing of waste materials; backfilling with suitable materials; compacting; and restoring (grading, topsoiling and seeding). For bridge mounted overhead sign structures, this price shall also include cutting existing anchor bolts, capping and sealing, hydraulic cement mortar or grout, and epoxy resin.

Remove Existing (Type) Sign Panel will be measured in units of each and will be paid for at the Contract each price for the sign panel type specified. This price shall include removing and disposing of the existing sign panel, framing and bracing, luminaires, conductor cables, and attachment hardware.

Relocate Existing (Type) Sign Panel will be measured in units of each and will be paid for at the Contract each price for the sign panel type specified. This price shall include removing sign panel, furnishing new mounting hardware and brackets, and installing onto new structure.

Section 700.06 Measurement and Payment is amended by revising the Pay Item Table as follows:

The following pay items are removed:

Pay Item	Pay Unit
Lighting pole (Standard, luminaire mounting height)	Each
Signal pole (Standard, class and type)	Each
Mast arm (Length)	Each

The following pay items are inserted:

Pay Item	Pay Unit
Lighting pole (Standard, luminaire mounting height or type)	Each
Signal mast arm pole (Standard and type)	Each
Steel strain pole (Standard and length)	Each
Mast arm (Length) (loading case)	Each
Remove existing (type) sign structure	Each
Remove existing (type) sign panel	Each
Relocate existing (type) sign panel	Each

GUIDELINES – For use on all projects with traffic signs.

[SS701-002016-01](#)

March 11, 2019

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 701—TRAFFIC SIGNS

SECTION 701—TRAFFIC SIGNS of the Specifications is amended as follows:

Section 701.02—Materials is replaced with the following:

- (a) **Reflective sheeting** shall conform to Section 247 and shall be selected from the Department’s Approved List 46. The color for the legend and background shall be in accordance with the MUTCD and as specified in the Plans.
1. **Overhead Permanent Signs** (signs attached to sign structures which overhang travel lanes) that are not illuminated with sign lighting shall use ASTM D4956 Type XI reflective sheeting. Overhead permanent signs that are illuminated with sign lighting shall use ASTM D4956 Type IX sheeting.
 2. **Non-Overhead Permanent Signs** (including ground-mount signs, signs attached to traffic signal supports, and signs attached to sign structures that do not overhang travel lanes) shall use ASTM D4956 reflective sheeting as follows:

Background Color of Sign	Sheeting Type¹
White	ASTM D4956 Type XI
Red	ASTM D4956 Type XI
Yellow	ASTM D4956 Type XI ²
Fluorescent Yellow-Green	ASTM D4956 Type XI ³
Green	ASTM D4956 Type XI
Black	ASTM D4956 Type XI
Purple	ASTM D4956 Type XI
Brown	ASTM D4956 Types IV, IX, or XI
Blue	ASTM D4956 Types IV, IX, or XI

¹The following signs may use ASTM D4956 Types IV, IX, or XI, regardless of color: Pushbutton education signs (R10-series signs mounted adjacent to pedestrian pushbuttons), Signs erected on bikeways physically separated from adjacent roads, R7- or R8-series parking restriction signs located on non-limited-access highways, D10-series Reference Location Signs (mile markers) and Intermediate Reference Location Signs, and Post-mounted street name signs.

²The yellow portions of all yellow W1-series (horizontal change of alignment) signs, W10-series (railroad warning) signs, and object markers, including supplemental plaques erected beneath those signs, shall be fluorescent. All other yellow sheeting on signs may be fluorescent or non-fluorescent.

³All temporary and permanent warning signs related to school zones, pedestrians, or bicyclists (including associated supplemental plaques) shall use fluorescent yellow-green sheeting where required by the VA Supplement to the MUTCD unless otherwise specified on the Plans.

- (b) **Sign panel rivets** for overhead signs attached to cantilever, butterfly, or truss sign structures shall be powder coated to match the color of the portion of the sign sheeting from which the

rivets will protrude. The rivets shall be fabricated in accordance with Standard Drawing SPD-1.

- (c) **Sign panel substrates for permanent flat sheet signs** shall be in accordance with the below table, and shall be smooth, flat, and free of metal burrs and splinters.

Sign width¹	Allowable substrate
47 inches and less	0.080 or 0.100 inch aluminum
48 inches and more	0.100 inch aluminum
Overlay panel	0.063 inch aluminum

¹For diamond-shaped signs, width is measured along the sign's edge.

Aluminum substrates for permanent flat sheet signs and overlay panels shall be aluminum alloy in accordance with Section 229.02(a).

- (d) **Extruded sign panels** shall conform to the Standard Drawings and Section 229.02(c).

- (e) **Temporary signs** shall conform to Section 512.02.

Section 701.03(a)2 Sign Panels is deleted.

Section 701.03(a)3 Applying retroreflective background sheeting is replaced with the following:

Applying retroreflective background sheeting: Sheeting shall be applied according to the manufacturer's instructions and the detailed requirements herein.

The Contractor shall fabricate sign panels 16 square feet or less from a single piece of applied sheeting with no joints, splices, or laps, except that one factory splice from each roll is permitted..

When applying more than one width of reflective sheeting to a sign panel, sheeting edges shall form a clean vertical joint. Sheeting edges shall be applied in accordance with manufacturer's installation instructions to prevent edge lifting and allow for sheeting expansion under high temperature and humidity conditions.

The finished sign shall be free from cracks, gaps, streaks, wrinkles, blisters, discoloration, buckles, and warps and shall have a smooth surface of uniform color.

Section 701.03(a)4 Letters, numerals, arrows, symbols, borders, and other features of the sign message is amended to replace the first paragraph with the following:

Letters, numerals, arrows, symbols, borders, and other features of the sign message: Features of the sign message shall conform to the MUTCD and the Virginia Standard Highway Signs Book. Units of the sign message shall be formed to provide a continuous stroke width with smooth edges and a flat surface free from warps, blisters, wrinkles, burrs, and splinters. Features shall also conform to the following:

Section 701.03(b) Transportation and Storing Signs from the Fabricator is amended to replace the third paragraph with the following:

The Contractor may remove signs from storage and install them on their structural supports before the structure is erected; however signs and structural supports placed in the field prior to erection shall be supported and stored at a sufficient angle to facilitate water runoff from the sign while preventing the sign from coming in contact with the ground and preventing sign structure elements from sitting in standing water.

Section 701.03(d) Erection is amended to replace the first paragraph with the following:

Erection: The Contractor shall install sign panels on overhead sign structures with the required minimum and maximum vertical clearances as shown on Standard Drawing OSS-1, and with the lateral and vertical placement shown on the Plans.

Section 701.03(d) Erection is amended to replace the fifth paragraph with the following:

Vertical and horizontal spacing between installed signs shall be approximately 1 inch where multiple signs are installed on the same structure, unless shown otherwise on the Plans.

Section 701.03(d) Erection is amended to replace the thirteenth paragraph with the following:

Overlay panels shall be erected with aluminum rivets no less than 3/16 inch in diameter and of such length as to fasten the panels securely and form a compressed head conforming to the manufacturer's recommendations. Rivets shall be located on 12-inch centers for 0.080 inch aluminum overlays and on 15-inch centers for 0.063 inch aluminum overlays, positioned 1 inch from each panel's edges, completely around the sign's perimeter. Where overlayment panels are 30 inches or greater in width, a column of rivets shall be installed on 12-inch centers for 0.080 inch aluminum overlays or 15-inch centers for 0.063 inch aluminum overlays down the centerline of the panel. Rivets shall be installed in such a sequence as to prevent buckling of the panels. When overlaying extruded aluminum signs, rivets shall be arranged to go through the flat part of the extrusion.

Section 701.03(f) Documentation Requirements is replaced with the following:

1. **Labels.** All new permanent signs shall include fabrication labels, and a VDOT Identification Label. Labels may be made of either a self-adhesive, permanent weather resistant material or permanent sign material, and shall be a minimum 4-inch by 4-inch in size.

All information on such signs shall be indicated with sign ink or other permanent means capable of resisting weathering for the full duration of the sign sheeting warranty period, except that dates may be indicated with punching out of appropriate squares. All new signs shall be indicated "new" on the VDOT Identification Label.

Prior to applying the labels, the area shall be thoroughly cleaned to ensure proper adhesion or application of ink. Labels shall be placed on the back side of the sign panel in a location where they will not be obscured by sign supports or mounting hardware.

- a. **Fabrication labels.** Labels provided by the sign fabricator that indicates sheeting manufacturer's name or logo, sheeting product designations, lot numbers, sign fabricator's name or logo, and month and year the sign was fabricated. All text and logos shall be at least 1 inch in height. For signs with multiple sheeting designations and/or multiple lot numbers, additional labels or supplemental labels are permitted.
 - b. **VDOT Identification Label.** VDOT's standard 4.5-inch by 4.5-inch label shall be affixed to all new permanent traffic control device signs, as per the Virginia Supplement to the MUTCD.
2. **Inventory Sheet.** The Contractor shall provide an .xlsx formatted file to the Engineer, using a sign inventory template provided by the Engineer. The file shall include the information required above for the label, as well as the following:
 - a. Route no.

- b. Project UPC no. (if applicable).
- c. Station or milepost information.
- d. Lane designation.
- e. *MUTCD*, if applicable and if denoted on the plans.
- f. Sign message.
- g. Sign width.
- h. Sign height.

The cost of preparing and submitting the .xlsx formatted file shall be included with the cost of the sign panel pay items.

Section 701.04 Measurement and Payment is amended to replace the first paragraph with the following:

Sign panels will be measured in square feet and will be paid for at the Contract square foot price. This price shall include sign substrate, background sheeting, sign messages, finishing, framing units, hanger assemblies, bracing, stiffeners, splicing, backing strips, post clips/post clamps, warranty, and labeling.

GUIDELINES – For use on all projects with traffic signals.

[SS703-002016-01](#)

December 14, 2018

VIRGINIA DEPARTMENT OF TRANSPORTATION
SUPPLEMENTAL SPECIFICATION FOR
SECTION 703—TRAFFIC SIGNALS

SECTION 703—TRAFFIC SIGNALS of the Specifications is amended as follows:

Section 703.02(d) Signal Heads is amended to replace the fourth and fifth paragraphs with the following:

Backplates shall be included with all vehicle traffic control signal heads unless otherwise specified in the Contract. Backplates shall be specifically manufactured for the type and brand of traffic signal heads used or shall be of a universal design expressly manufactured for various types and brands of traffic signal heads. Backplates shall have a border width of 5 inches, shall be without louvers, and be of one-piece construction with the exception of those for five-section cluster signal heads, which may be a maximum of three pieces. All outside corners on backplates shall have a 3-inch radius.

Black Signal Backplates (both sides) and signal leveling attachments shall be flat black. Black signal backplates shall be aluminum or aluminum composite. Aluminum and aluminum composite shall conform to Section 238.

High-Visibility Signal Backplates (HVSBs) shall be provided if specified in the plans. HVSBs may be aluminum or aluminum composite; ABS plastic shall not be used. HVSBs shall be preassembled by the manufacturer in accordance with Section 238 of the Specifications.

Section 703.03(e)1a is replaced with the following:

Unless otherwise directed by the Engineer, backplates shall be attached with either bolts, washers, and lock nuts, or with self-tapping screws and washers.

The minimum number of fasteners connecting the backplate to the traffic signal head shall be four for each 12-inch traffic signal head section. Fasteners and all miscellaneous hardware shall be stainless steel unless otherwise directed by the Engineer. The fasteners shall be a minimum 3/16 inch diameter and 1/2 inch long.

When HVSBs are to be installed on new signal heads, cutting the backplate is not required unless otherwise directed by the Engineer.

Section 703.04—Measurement and Payment is amended to replace the thirteenth paragraph with the following:

Traffic Signal Head Section will be measured in units of each for the LED module size and backplate type specified and will be paid for at the Contract each price. This price shall include mountings, molded terminal block, visor, backplate, retroreflective sheeting (if required), fittings, realignments, and LED module.

Section 703.04—Measurement and Payment is amended by revising the Pay Item Table as follows:

The following pay item is removed:

Pay Item	Pay Unit
Traffic signal head section (Size and type)	Each

The following pay item is inserted:

Pay Item	Pay Unit
Traffic Signal Head Section (LED module size, backplate type)	Each

Included in the [2019 Supplement to the 2016 Specifications page 87](#)

[SS704-002016-02](#)

February 3, 2017

VIRGINIA DEPARTMENT OF TRANSPORTATION
2016 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS
SECTION 704—PAVEMENT MARKINGS AND MARKERS

SECTION 704—PAVEMENT MARKINGS AND MARKERS of the Specifications is amended as follows:

Section 704.01—Description is replaced with the following:

This work shall consist of establishing the location of retroreflective pavement markings and installing pavement markings and pavement markers in accordance with the *MUTCD*, the Contract, and as directed by the Engineer.

Section 704.02—Materials is amended to include the following:

(d) **Contrast Pavement Markings** shall conform to Section 246 of the Specifications.

Section 704.03(a)2 Type B markings is amended to replace the first paragraph with the following:

Type B markings shall be applied in accordance with the manufacturers' installation instructions.

Section 704.03(a)2.e Patterned preformed tape (Class VI) is amended to replace the third, fourth, and fifth paragraph with the following:

The Contractor shall ensure that markings are not degraded by subsequent operations. Markings that are improperly inlaid during the pavement operations shall be completely eradicated and reapplied via non-embedded surface application at the Contractor's expense.

Surface-applied Type B Class VI markings shall not be installed directly over existing markings, except that Type B Class VI markings may be installed over Type A markings that are fully dry and are at a thickness of 10 mils or less.

Section 704.03(a)2.f Polyurea (Class VII) is replaced with the following:

Polyurea (Class VII) shall be applied in accordance with the manufacturer's installation instructions. Polyurea marking material shall not be applied over existing pavement markings unless the existing marking is 90 percent worn away or eradicated; or over Type A markings that are fully dry and are at a thickness of 10 mils or less.

Polyurea marking material shall be applied at a wet film thickness of 20 mils (± 1 mil). Glass beads and retroreflective optics shall be applied at the rate specified in the VDOT Materials Division's Approved Products List 74 for the specific polyurea product.

Section 704.03(b) Pavement messages and symbols markings is amended to replace the second paragraph with the following:

Message and symbol markings include, but shall not be limited to, those detailed in Standard Drawing PM-10.

Section 704.04—Measurement and Payment is amended to replace the second paragraph with the following:

Contrast Pavement Line Marking will be measured in linear feet and will be paid for at the Contract unit price per linear foot for the type or class and width specified. This price shall include surface preparation, premarking, furnishing, installing, quality control tests, daily log, guarding devices, primer or adhesive, glass beads, reflective optics materials when required, and warranty.

Pavement message markings will be measured in units of each per location or in linear feet as applicable and will be paid for at the Contract unit price per each or linear foot. This price shall include surface preparation, premarking, furnishing, installing, quality control tests, daily log, guarding devices, primer or adhesive, glass beads, reflective optics materials when required, and warranty.

Pavement symbol markings will be measured in units of each per location for the symbol and type material specified and will be paid for at the Contract unit price per each. This price shall include surface preparation, premarking, furnishing, installing, quality control tests, daily log, guarding devices, primer or adhesive, glass beads, reflective optics materials when required, and warranty.

Section 704.04—Measurement and Payment is amended to replace the Pay Item Table with the following:

Pay Item	Pay Unit
(Type or class) Pavement line marking (width)	Linear Foot
(Type or Class) Contrast Pavement Line Marking (width)	Linear Foot
Pavement message marking (Message)	Each or Linear Foot
Pavement symbol marking (Symbol, Type or class material)	Each
(Type) Pavement marker (type pavement)	Each