



DIVISION VII – TRAFFIC CONTROL DEVICES

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

VDOT web file users (“pdf”) may obtain more information and other resources by downloading the accompanying “zip” file (compressed WORD® files).

<http://www.virginiadot.org/business/resources/const/07ImpRev.zip>

These sheets may also be found at the following locations:

Global Web Access: <http://www.virginiadot.org/business/const/spec-default.asp>

VDOT Only Access: https://outsidevdot.cov.virginia.gov/POJQP/2007_Standard_Specifications/Forms/AF.aspx

TABLE OF CONTENTS

| | | |
|---|-------|------|
| ———— STANDARD 700 SERIES SPCNs, SPs and SSs ————— | ..... | 7-1 |
| c704bm1 COVER CLEAN & INSPECT EXIST. RAISED PAVE. MARKERS 9-17-15c (SPCN) | ..... | 7-2 |
| c704cm1 SWEEPING PRIOR TO PAVEMENT MARKING 7-28-14 (SPCN) | ..... | 7-2 |
| S704E02 - TYPE B, CLASS VI PAVEMENT LINE MARKING TAPE 10-21-11 | ..... | 7-3 |
| S704GM2 - REPLACE PAVE. LINE MARK., PAVE. MARKERS & LOOP DETECT. 9-27-11 | ..... | 7-8 |
| S704M06 - SEC. 704—PAVEMENT MARKINGS AND MARKERS 12-9-15c | ..... | 7-9 |
| S704N00 - TYPE B, CLASS VII POLYUREA PAVEMENT MARKINGS 10-17-11 | ..... | 7-28 |
| SS70005 - SUPP. SEC. 700—GENERAL 4-15-15 | ..... | 7-31 |
| SS70103 - SUPP. SECTION 701—TRAFFIC SIGNS 4-15-15 | ..... | 7-39 |
| SS70301 - SUPP. SECTION 703—TRAFFIC SIGNALS 1-6-09 | ..... | 7-40 |
| SS70402 - SUPP. SEC. 704—PAVEMENT MARKINGS & MARKERS 4-15-15 | ..... | 7-41 |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

———— CNSP SELECT USE 700 SERIES SPCNs and SPs ————7-45

SAW CUT 10-2-08a (SPCN)7-46

PREFORMED THERMOPLASTIC PAVEMENT MARKINGS 11-29-11b.....7-47

PAVEMENT DOTTING 10-8-08a7-50

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

- 1-
- 2-
- 3-
- 4-
- 5-
- 6-
- 7-

———— STANDARD 700 SERIES SPCNs, SPs and SSs ————

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES – ASPHALT RESURFACING (SURFACE TREATMENT, SLURRY SEAL AND LATEX ONLY). NOT NEEDED WHEN VOLUME 2 SURFACE TREATMENT AND SLURRY/LATEX IS USED.

(c704bm1-1015)

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 in accordance with 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 (SPCN)

GUIDELINES – ASPHALT PROJECTS (SURFACE TREATMENT ONLY). NOT NEEDED WHEN VOLUME 2 SURFACE TREATMENT IS USED.

(c704cm1-1014)

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 (SPCN)

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES — FOR PROJECTS REQUIRING TYPE B, CLASS VI PAVEMENT LINE MARKING. INCLUDE: SS70402 Pavement Markings and Markers.

S704E02-1211

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
TYPE B, CLASS VI PAVEMENT LINE MARKING TAPE

October 21, 2011

I. DESCRIPTION

This work shall consist of furnishing and installing a profiled (non-flat), permanent, white or yellow preformed pavement line marking tape at locations shown on the plans and as directed by the Engineer.

II. MATERIALS

Marking tape shall be a retro-reflective pliant polymer material consisting of a mixture of polymeric materials, pigments and glass beads (reflective optics) distributed throughout its cross-sectional area with a reflective layer of beads (reflective optics) embedded into the surface. The surface of the tape shall exhibit raised areas resulting in a profiled (non-flat) surface.

The shelf life of the tape for use on facilities constructed or maintained by the Department shall be one year from the date of manufacture when stored in accordance with the manufacturer's requirements.

The marking tape shall not be formulated with any compounds of the heavy metals listed in 40 CFR 261.24 Table 1, except that barium sulfate is allowed. Total heavy metals, with the exception of barium sulfate, shall not exceed 20 times the specified regulatory limits. Materials that must be heated for application shall not exude fumes that are toxic or injurious to persons or property when heated to the application temperature.

The marking tape shall be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal range of pavement temperatures. The marking tape shall be capable of application to new and existing asphalt or hydraulic cement concrete at pavement surface temperatures of 45 to 180 degrees Fahrenheit. Where installed with adhesive, the adhesive shall be per the manufacturer's instructions. The marking tape shall also be capable of being inlaid during installation of the final riding surface during paving operation on new, dense, or open-graded asphalt concrete and shall be ready for traffic immediately after application.

Marking tape shall be weather resistant and after installation shall show no significant tearing, roll back, lifting, shrinkage, or other signs of poor adhesion, nor appreciable bleeding or discoloring (fading), which will impair the intended use of the marking tape throughout its intended service life.

The marking tape shall not deteriorate because of contact with sodium chloride, magnesium chloride, calcium chloride, mild alkalies and acids, or other ice control materials, oils in the pavement material, or oil and gasoline drippings from vehicles.

When the pay item specifies Type B, Class VI Contrast pavement marking tape, the tape shall be an additional 3 inches minimum wider than the width specified in the pay item. This additional tape width shall be black non-reflective with 1 ½ inches minimum on both sides of the white.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

A. Initial Approval Requirements:

Marking tape products will be included on the Department's Materials Division Approved Products List after the Department determines conformance to these specifications. Determination of conformance will include, but will not be limited to, the evaluation of initial and one year test data from AASHTO's National Transportation Product Evaluation Program (NTPEP) on a northern deck or other VDOT approved facilities.

If tested through AASHTO/NTPEP, the marking tape shall have been installed, tested, and met the following requirements on asphalt and concrete surfaces. If tested on another VDOT approved facility, VDOT reserves the right to test and approve tapes based upon in-service performance data on either asphalt or hydraulic cement concrete or both types of concrete surfaces.

AASHTO/NTPEP Testing – Test data values used for approval shall be based upon the data generated per the NTPEP, Pavement Marking Material (PMM) Work Plan.

VDOT Test Facility – Test data values used for approval shall be based upon the data generated by following the testing requirements in Virginia Test Method (VTM)-125 to define the evaluation sections and number of measurements needed. VDOT reserves the right to evaluate durability, skid resistance, and no Track Time based upon field (in-service) performance, VDOT lab testing, or third party testing.

The manufacturer shall certify each batch or lot of material supplied is the same product (binder and reflective optics) that was tested and approved on the NTPEP or VDOT test facility in accordance with the Materials Division, Manual of Instructions for Certification II materials.

1. Retroreflectivity

Tapes shall have the following retroreflectance values after installation when measured in accordance with the requirements of ASTM E 1710. The reflectance values for NTPEP acceptance will be determined from outside of the wheel path. The photometric quantity to be measured shall be Coefficient of Retroreflected Luminance (R_L) and shall be expressed as Millicandelas per square foot per footcandle $[(mcd \cdot ft^{-2}) \cdot fc^{-1}]$.

| Coefficient of Retroreflected Luminance(R_L) ($mcd \cdot ft^{-2} \cdot fc^{-1}$) | | |
|---|------------|---------------|
| Color | New | 1 Year |
| White | 500 | 300 |
| Yellow | 300 | 200 |

2. Day and Nighttime Color:

Daytime and Nighttime Color including Luminance Factor (Cap Y) shall conform to the requirements of ASTM D 6628 when initially installed and then after 1 year. Color and Luminance Factor values for NTPEP acceptance will be determined from outside of the wheel path. Night color may be measured in accordance with VTM-111 or with portable night color instrumentation per ASTM D 6628.

3. Durability Rating:

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

No tape line shall be displaced, torn or missing. The tape shall have a durability rating of at least 4 (40% retained) when evaluated in the wheel path area after 1 year when tested in accordance with NTPEP, PMM Work Plan.

4. Skid Resistance:

The surface of the tape shall provide an initial minimum skid resistance value of 45 BPN when tested in accordance with ASTM E 303.

III. INSTALLATION

Marking configurations shall be installed in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices" (MUTCD), the Virginia Supplement to the MUTCD and the Virginia Work Area Protection Manual (latest edition).

Markings shall be installed either under the guidance of the manufacturer's representative or by the manufacturer's certified installer.

Markings to be installed on existing asphalt concrete roadway surfaces or existing and new hydraulic cement concrete surfaces shall be applied in strict accordance with the manufacturer's recommendations for pavement surface preparation and installation techniques for non-embedded surface applications.

Upon delivery of the material to the Contractor, the Contractor shall store all tape in accordance with the manufacturer's requirements until the day of installation, unless otherwise approved. Tape shall not be installed if the material has exceeded its shelf life, has been improperly stored, has deteriorated or is otherwise damaged.

Type B, Class VI markings to be inlaid in new asphalt surfaces shall be installed in accordance with the manufacturer's recommendations for surface preparation and installation techniques. Temperature requirements of the asphalt concrete and the type and size of roller allowed shall be in accordance with the tape manufacturer's recommendations. The Contractor shall maintain the road design cross section unless otherwise modified by the contract requirements and ensure that markings are not degraded by the paving operations.

Markings shall not be installed directly over longitudinal pavement joints or existing markings.

IV. POST-INSTALLATION EVALUATION

Following installation, and prior to final acceptance, a visual evaluation will be made to assess the condition, retroreflectivity, and color of the marking tape. If problem areas are found, an inspection will be made by the Department, the Contractor, and tape manufacturer's representative to identify specific areas of concern. If needed, the suspect areas shall be tested by the Contractor and/or VDOT representative in accordance with VTM-125 to define the evaluation sections and the number of measurements needed. Acceptable test result shall meet the requirements for reflectivity and color specified in Section II, Initial Approval Requirements. Those markings found to be less than the values listed in Initial Approval Requirements for Retroreflectivity and Day and Nighttime Color (1 Year) shall be eradicated and replaced by the Manufacturer at no cost to the Department. Tape that exhibits signs of significant tearing, roll back, lifting, shrinkage, or other signs of poor adhesion will be replaced by the Contractor at no cost to the Department. All costs associated with testing the marking tape for retroreflectivity, color, and adhesion, including the cost of maintenance of traffic, shall be borne by the Contractor.

V. WARRANTY

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

The pavement marking tape shall be warranted against failure resulting from material defects regardless of method of manufacturer's prescribed application or pavement type. The material shall be warranted to retain its color, retroreflectivity, adherence to the pavement and shall be free of other obvious defects or failures. All pavement marking tape that has failed to meet the warranty conditions shall be replaced with no additional payment.

The warranty shall cover all pavement striping materials (regardless of method of installation), labor, equipment, mobilization\demobilization, tools, incidentals required to remove (eradicate) and replace the pavement striping including maintenance of traffic during the removal and reinstallation operations.

Material guarantees that are given by the manufacturer shall be obtained by the Contractor and assigned to the Commonwealth in writing prior to final acceptance.

A. Retroreflectivity

White and Yellow longitudinal pavement marking tape shall remain effective for its intended use under normal traffic conditions and meet the minimum Coefficient of Retroreflected Luminance (R_L) of 100 millicandelas per square foot per footcandle [$(\text{mcd}\cdot\text{ft}^{-2})\cdot\text{fc}^{-1}$] when measured in accordance with the requirements of ASTM E 1710 for the following duration:

Longitudinal Marking Tape Retroreflective Warranty Period

| | |
|--|---------|
| New Asphalt Concrete Pavement (Inlay) | 6 Years |
| Existing Asphalt Concrete Pavement (Overlay) | 6 Years |
| Portland Cement Concrete (PCC) Surfaces | 6 Years |

B. Color

Longitudinal pavement marking tape shall remain effective for its intended use under normal traffic conditions and meet the minimum Daytime and Nighttime color including Luminance Factor (Cap Y) per ASTM D 6628 for the following duration:

Longitudinal Marking Tape Color Warranty Period

| | |
|--|---------|
| New Asphalt Concrete Pavement (Inlay) | 4 Years |
| Existing Asphalt Concrete Pavement (Overlay) | 4 Years |
| Portland Cement Concrete (PCC) Pavement Surfaces | 4 Years |

C. Material Loss

Solid Longitudinal Line – more than five percent of the substrate is exposed in any 2000 ft section of pavement marking or 50 ft or more of continuous loss.

Broken Line – more than five percent of the substrate is exposed in any 2000 ft section of pavement marking or the loss of two consecutive skips.

VI. MEASUREMENT AND PAYMENT

Type B, Class VI pavement line marking tape will be measured in linear feet for the width specified and will be paid for at the contract unit price per linear foot, which price shall be full compensation for furnishing and installing pavement line markings, surface preparation, and testing and warranty.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Payment will be made under:

| Pay Item | Pay Unit |
|---|-----------------|
| Type B, Class VI pavement line marking (Width) | Linear foot |
| Type B, Class VI contrast pavement line marking (Width) | Linear foot |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES – ASPHALT PROJECTS (PLANT MIX ONLY)**S704GM2-1211**

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
**REPLACEMENT OF PAVEMENT LINE MARKINGS,
PAVEMENT MARKERS AND LOOP DETECTORS**

September 27, 2011

Certain plant mix line items will be designated to have traffic engineering items (pavement markings, pavement markers and loop detectors) replaced under this contract. Replacement of pavement line markings, pavement markers and loop detectors will have the same time limits or restrictions that apply to the plant mix line items and shall be performed in accordance with the following, unless otherwise specified:

1. Pavement Markings shall be installed in accordance with Section 704 of the Specifications, and in accordance with the procedures and within the time limits set forth elsewhere in the Contract.
2. Pavement Markers shall be installed within 30 calendar days after the affected area is resurfaced. Pavement Markers shall not be installed prior to the installation of such pavement markings as centerline and lane-division pavement line markings.
3. Loop Detectors shall be installed in accordance with the requirements of Section 703 of the Specifications.

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

Loop detectors installed prior to overlay operations shall be installed 3 inches below the planed surface. Loop detectors installed after the final overlay shall be installed no more than 4.5 inches and no less than 4 inches below the top elevation of the final riding surface.

Loops shall be installed with loop detector cable enclosed in tubing (IMSA 51-5). Loop cable and loop sealant shall be from the Virginia DOT Pre-approved Traffic Control Device Listing. Link: http://www.vdot.virginia.gov/business/resources/APPROVED_product_LISTING.pdf

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

When an existing loop detector is taken "out of service" as a result of the Contractor's planing operation the Contractor shall have the new loop detector items installed and operational within 96 hours of the "out of service" time and date, 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. PLEASE NOTE: Installation of loop detectors shall be performed in the presence of the Engineer.

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

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES – SURFACE TREATMENT, SLURRY SEAL, LATEX EMULSION TREATMENT, AND PLANT MIX PROJECTS. NOT NEEDED WHEN VOLUME 2 IS USED.**S704M06-1215**

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

December 9, 2015c

SECTION 704—PAVEMENT MARKINGS AND MARKERS of the Specifications is replaced with the following:

704.01—Description

This work shall consist of establishing the location of and installing temporary pavement markings; and installing permanent pavement markings and pavement markers in accordance with the MUTCD and Virginia Supplement to the MUTCD, these specifications, the Contract Documents, and as directed by the Engineer.

704.02—Materials

All pavement marking materials shall be selected from the VDOT Materials Division's *Approved Products List* for the specified types of marking materials as noted herein.

The Contractor shall use a Department-approved inventory tracking system for all materials received from the manufacturer. Shipment of materials from such inventory shall be accompanied by a signed Form C-85 containing the following certification statement: *Material shipped under this certification has been tested and approved by the Department as indicated by the laboratory test numbers (MS#) listed hereon.*

- (a) **Pavement Markings** shall conform to Section 246 of the Specifications.
- (b) **Glass Beads** shall conform to Section 234 of the Specifications.
- (c) **Pavement Markers** shall conform to Section 235 of the Specifications.
- (d) **Flexible Temporary Pavement Markers (FTPMS)** shall conform to Section 235. 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.

Flexible Temporary Pavement Markers (FTPMS) shall consist of products from the VDOT Materials Division's *Approved Products List*. FTPMs shall include a removable material covering the reflective lens to protect the lens from being obscured or damaged during the paving operation.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

TABLE VII-3

| Pavement Marking Materials Type | Class | Name | Temporary/Permanent | Surface Temp. at Time of Application | Film Thickness (mils) | Approved List No. | Application Limitations |
|---------------------------------|--------|---------------------------------------|---------------------|--------------------------------------|--|-------------------|---|
| A | | Traffic Paint | Permanent | 50°F+ (Note 6) | 15 ± 1 when wet | 20 | May be applied directly after plant mix operations |
| B | I | Thermoplastic Alkyd | Permanent | (Note 6) | 90 ± 5 | 43 | May be applied directly after plant mix operations |
| | I | Thermoplastic Hydrocarbon | Permanent | (Note 6) | 90 ± 5 when dry | 43 | Do not apply for less than 30 days after plant mix operations |
| | II | Preformed Thermoplastic | Permanent | (Note 6) | 120-130 | 73 | (Note 3) |
| | III | Epoxy Resin | Permanent | (Note 6) | 20 ± 1 when wet | 75 | (Note 3) |
| | IV | Plastic-backed Preformed Tape | Permanent | (Note 6) | 60 - 120 | 17 | (Note 3) |
| | VI | Patterned Preformed Tape | Permanent | (Note 6) | 20 min (Note 1) 65 min (Note 2) | 17 | (Note 4) |
| | VII | Polyurea | Permanent | (Note 6) | 20 ± 1 | 74 | (Note 3) |
| D | II | Removable Tape | Temporary | (Note 6) | (Note 3) | 17 | |
| | III | Wet Reflective Removable Tape | Temporary | (Note 6) | (Note 3) | 17 | |
| E | | Removable Black Tape (Non-Reflective) | Temporary | (Note 6) | (Note 3) | 17 | Pavement marking for covering existing markings (Note 7) |
| F | I & II | Temporary Pavement Markings Paint | Temporary | (Note 6) | 15 max when wet (Note 5) | 48 | |
| FTPM | | Flexible Temporary Pavement Markers | Temporary | (Note 6) | | 22 | (Note 3) |

Note 1: Thinnest portion of the tape's cross section.

Note 2: Thickest portion of the tape's cross section.

Note 3: In accordance with manufacturer's installation instructions.

Note 4: In accordance with the manufacturer's installation instructions, except that Type B, Class VI markings on plant mix overlay surfaces shall be inlaid in the freshly installed asphalt surface and not surface applied.

Note 5: When Type F paint is used as a temporary marking on the final surface prior to installation of permanent markings, the film thickness shall be 8-10 mils when wet except lane lines on arterial roads 10,000 or greater with posted/statutory 45 mph or greater may be 10 to 15 mils if expected to be in service for greater than 14 days.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Note 6: Surface temperature at time of application shall be in accordance with manufacturer's installation instructions. If the installation instructions do not specify minimum surface temperature, then the markings shall not be installed unless surface temperature at time of application is 50 degrees F or higher.

Note 7: Type E pavement markings shall not be used on hydraulic cement concrete.

704.03—Documentation of Existing Markings and Markers

The Contractor shall provide construction field staking in the field that documents, at a minimum: 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 documents shall be staked, as appropriate, to identify the proposed location of the new permanent markings instead of existing markings placement. All staking shall be completed and the Engineer notified at least 14 days prior to the scheduled start of resurfacing operations.

The Contractor shall reference this staking when installing temporary markings (if required as specified herein), 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 Pavement Marking (PM) Series of the VDOT *Road and Bridge Standards*, the contract documents or by the Engineer. All existing markers shall be replaced with new markers of the same color unless otherwise directed in the contract documents or by the Engineer.

704.04—Temporary and Permanent Pavement Marking Installation

Pavement markings shall be white or yellow markings (unless otherwise specified) as required by the MUTCD or the Virginia Supplement to the MUTCD for the specific location or as specified by the Engineer. The sizes and shapes of preformed symbols/characters, or the templates used to create such symbols/characters for non-preformed markings, shall match the size and shape specified in the VDOT *Road & Bridge Standards* and in the Contract Documents. Hand-drawn or "stick" symbols/characters are not allowed.

Once received by the Contractor, all pavement marking materials shall be stored in accordance with the manufacturer's requirements until the day of installation, unless the Engineer otherwise authorizes. Pavement marking materials shall not be installed if the material has exceeded its shelf life, has been improperly stored, has deteriorated or is otherwise damaged.

The markings shall be installed in accordance with Table VII-3 (Pavement Marking Materials) unless otherwise recommended by the manufacturer and approved by the Engineer. The Contractor shall furnish a copy of the manufacturer's installation instructions to the Engineer prior to installation.

Glass beads shall be applied at the rate specified herein, and shall be evenly distributed over the entire surface of the marking. The Contractor shall apply beads to the surface of liquid markings with a bead dispenser attached to the applicator. The applicator shall uniformly dispense beads simultaneously on, and in the just-applied marking. The bead dispenser shall be equipped with a cut-off control synchronized with the cut-off control of the applied marking material so that the beads are applied throughout the completed marking. Beads shall be applied while the liquid marking is still fluid. Approximately 70 percent of beads shall be completely buried in the marking, and the remaining 30 percent shall be 50 to 60 percent embedded in the marking's surface. Beads installed on crosswalks and stop lines on roadways with curbs only (no gutter) may be hand-applied for two feet at the end of each line next to the curb with 100 percent of the beads embedded 50 to 60 percent into the marking's surface.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

The Contractor shall exercise caution and protect the public from damage while performing pavement marking operations. The Contractor shall be responsible for the complete preparation of the pavement surface, including but not limited to removing dust, dirt, loose particles, oily residues, curing compounds, concrete laitance, residues from eradication, and other foreign matter immediately prior to installing pavement markings.

Liquid markings shall be applied so as to prevent splattering and overspray and shall be protected from traffic until track-free by the use of traffic control guarding or warning devices as necessary. If a vehicle crosses a pavement marking and tracks it or if splattering or overspray occurs, the affected marking and resultant tracking, splattering, or overspray shall be removed and new markings shall be applied at the Contractor's expense.

Equipment shall also be thoroughly cleaned between changes in colors or types of materials.

Temporary and Permanent Pavement Markings shall have clean and well-defined edges without running, bleeding, overspray or deformation. Temporary markings to be covered by permanent pavement markings shall be completely covered by the permanent markings or shall be eradicated at no additional cost to the Department. Markings shall be uniform in appearance; free of waviness (waviness is defined as the edge of the marking shall not vary from a straight line more than ¼ inch in three feet or more than one inch in fifty feet for a maximum distance of 500 feet); shall be straight on tangent alignment; and shall be on a true arc on curved alignment. Message and symbol markings shall be free of overlaps.

The widths of pavement markings shall not deviate more than 1/4 inch on tangent nor more than 1/2 inch on curves from the required width. The length of the gap and the length of the individual stripes that form skip lines shall not deviate more than 2 inches from their required lengths. The length of the gap and individual skip line shall be of such uniformity throughout the entire length of each that a normal striping shall be able to repeat the pattern and superimpose additional striping upon the existing marking.

(a) Maximum Allowable Time Limits for Unmarked Roads:

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

If the Contractor begins the next resurfacing operation 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. For the straight segments of non-limited access road posted/statutory limit less than 45 mph, if all the lanes are delineated by the milled surface or asphalt overlay and "Unmarked Pavement Ahead" or "No Center Line" warning signs are properly installed, the Engineer may further extend the time limit for temporary markings on straight segments of non-freeway roads. The Engineer may approve an extension of the time limits, and set conditions, for roads posted/statutory limit less than 45 mph as follows:

- 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,
- Or allow FTPM's to be installed for lane delineation in curved segments and in straight segments where lane delineation on the interim surface is not clear to the drivers.

For final surfaces (including but not limited to plant mix operations, surface treatment, slurry seal, and latex emulsion 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

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

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

| Road Type | Maximum allowable duration for unmarked roads | Note(s) |
|--|---|------------------|
| Interstates and other freeways (limited access roads) posted at 55 MPH or greater (including interstate/freeway ramps) | <p>All lane line markings, at a minimum, shall be temporarily or permanently installed before opening the lane to traffic.</p> <p>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 (the texture has weathered-in).</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> | Note 1 |
| Non-freeway roads with ADT of 10,000 or greater (Traffic Groups XV and above) | <p>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.</p> <p>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.</p> | Note 2 Note 3 |
| 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. | Note 4 Note 5 |
| Non-freeway roads with ADT less than 3,000 (Traffic Groups I - X) | 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. | |

Note 1: For 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.

Note 2: If an approach to a signalized intersection, has two or more approach through lanes, 45 mph or greater speed limit, greater than 3000 ADT and 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 when the unmarked approach was first opened to traffic as per the Virginia WAPM.

Note 3: If the Contract Documents require temporary symbol/message markings or temporary edge line markings, unless a time extension is approved by the Engineer, 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.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Note 4: If the milled surface or new pavement provides delineation of the lanes or if the next resurfacing operation will obliterate the temporary markings within approximately **24 hours**, the Engineer may approve an extension of time if the posted/statutory limit is less than 45 mph and scheduling of the next interim surface is documented, and all "Unmarked Pavement Ahead" or "No Center Line" warning signs were properly installed when the unmarked approach was first opened to traffic.

Note 5: When Type F paint is used as a temporary marking on the final surface prior to installation of permanent markings, the film thickness shall be at least 8-10 mils when wet except lane lines on Interstate and Limited Access Roadways with AADT of 10,000 or greater with posted/statutory 45 mph or greater may be 10 to 15 mils if expected to be in service for greater than 14 days

(b) Temporary Pavement Markings:

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

Temporary pavement markings specified in the Contract Documents, including longitudinal lines and message markings, shall be installed at the same locations that the permanent pavement markings are to be installed.

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

Type F paint shall be installed in accordance with the manufacturer's installation instructions and as follows:

| | Milled Surface | Intermediate Lifts or Final Surface |
|------------------------------------|--|---|
| Thickness | 15 mils | 8 to 10 mils** |
| 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.) |

** Type 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 F 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 shall comply with the following:

1. Skip- and solid- lane line markings shall be required at all locations unless directed otherwise in the Contract Documents.
2. Centerline markings shall be required at all locations unless directed otherwise in the Contract Documents. Temporary passing zone markings shall be at the same location and pattern as the permanent markings.
3. Edgelines shall be required only when specified in the Contract Documents and only after the surface has reached a condition to support the markings and the equipment, or when

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

- directed by the Engineer. Temporary edgelines are not required when the shoulder surface is in a milled condition.
4. Dotted Line Extensions that delineate turning paths or offset lane alignments through intersections shall be required only when specified in the Contract Documents.
 5. Stop lines shall be required only when specified in the Contract Documents. Temporary stop lines shall be 12 inches wide unless specified otherwise.
 6. Turn Arrows shall be required only when specified in the Contract Documents.
 7. Lane Drop Arrows and "MERGE" markings shall be required only when specified in the Contract Documents, or when directed by the Engineer.
 8. Railroad Crossing Symbols shall be required only when specified in the Contract Documents, or when directed by the Engineer.
 9. Crosswalks shall be required only when specified in the Contract Documents. Temporary crosswalks shall be parallel 6 inch white lines unless otherwise specified.
 10. Other markings shall be required only when specified in the Contract Documents.

Temporary lane lines, centerlines, and edge lines may be marked with Type D removable tape, Type F-temporary paint, or FTPMs. All temporary symbol/message markings and other types of temporary markings (including dotted line extensions, stop lines, and crosswalks) may be marked with Type D-removable tape or Type F-temporary paint with at least 3 lbs. of glass beads per gallon.

The VTM-94 moisture test is not required for temporary pavement marking. However, if the VTM-94 moisture test is not performed, the Contractor shall make a qualitative surface wetness assessment and note the results 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 the VTM-94 moisture test and the temporary markings applied to a visibly dry surface do not sufficiently adhere to the surface, no additional payment will be made by the Department for temporary pavement marking reapplication (including Maintenance of Traffic costs associated with temporary pavement marking reapplication).

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.

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 of the Specifications, 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 F-temporary paint shall be reapplied. Under such circumstances, no additional payment will be made by the Department for temporary pavement marking reapplication, including Maintenance of Traffic costs for reapplication.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

If temporary pavement markings are Type F and do not meet the requirements of Section 512 of the Specifications 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 F-markings at the Contractor's expense as directed by the Engineer.

Permanent pavement markings shall not be installed atop Type F-markings if the paint exceeds the maximum specified thickness in Table VII-3, or is not fully dry. 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 prior to installation of permanent markings. No additional payment will be made for eradication of excess temporary pavement markings, including Maintenance of Traffic costs, when eradication is required prior to installation of permanent markings.

(c) Premarking:

When establishing the location of pavement markings, the Contractor may mark the locations of proposed permanent markings on the roadway by installing premarking materials. Premarkings may be accomplished using Type D removable tape, chalk, or lumber crayons; except symbol/message pavement markings such as stop lines, crosswalks, messages, hatching, etc., shall be premarked using chalk or lumber crayons. Premarkings shall be of the same general color as the pavement markings being premarked.

When tape is used as a premarking material, premarking shall consist of 4-inch by 4-inch-maximum squares or 4-inch-maximum diameter circles spaced at 100-foot minimum intervals in tangent sections and 50-foot-minimum intervals in curved sections. At locations where the pavement marking will switch colors (e.g. gore marking) the ends of the markings may be premarked regardless of the spacing.

When the Contractor uses chalk or lumber crayon as premarking, the entire length of the proposed pavement marking may be premarked.

Premarkings shall be installed so their installation will not affect the adhesion of the permanent markings. When Type D tape is used as the premarking material and the lateral location of such premarkings to the final pavement markings exceeds 6 inches, the Type D premarkings shall be removed at no additional cost to the Department.

(d) Eradication:

Eradication of existing pavement markings shall be in accordance with Section 512 of the Specifications, except where new markings will cover the existing markings, at least 90 percent removal of the existing markings is required.

(e) Permanent Pavement Markings:

The pavement surface shall be clean and dry at the time of permanent pavement marking installation as tested in accordance with VTM-94. The Contractor shall be responsible for providing the apparatuses that are needed to perform the moisture test prior to application.

Permanent markings shall not be installed directly over longitudinal pavement joints except to cross the joint perpendicularly or at an angle.

All permanent linear and message/symbol markings on (a) Interstate and Limited Access Roadways posted at 55 MPH or greater, (b) all other roadways with 10,000 ADT or greater and posted or statutory speed limit of 45 mph or greater, shall be placed within the following time limits:

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

- 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 Latex Emulsion and Surface Treatment operations:
 - a. 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.
 - b. If that evaluation ascertains that the pavement surface meets the markings manufacturer's requirements and specifications 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. Otherwise the contractor shall notify the Engineer why the pavement surface does not meet the markers manufacturer's requirements and all permanent markings shall be completed between 30 days and 45 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/non-freeway) roads with less than 10,000 ADT or posted/statutory speed less than 45 MPH), all permanent linear and message/symbol markings shall be installed within 30 days on plant mix surfaces and between 30 and 45 days on surface treatment/slurry seal/latex emulsion surfaces, after the end of the last workday of continuous paving on that section of roadway. Exceptions will be granted by the Engineer only when pavement curing time or weather conditions prohibit installation or the texture is not weathered-in on the edges and the pavement surface does not meet the markings manufacturer's requirements.

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

Permanent pavement markings shall be of the material specified in the Contract Documents.

Permanent pavement markings shall not be installed atop surface-treatment/slurry seal/latex emulsion surfaces until at least 14 days (and up to 30 days if Type B Class VI is installed) after completion of the paving operation, and only after the contractor determines that the surface has sufficiently cured (weathering-in of the texture) to support the permanent pavement markings in accordance with the manufacturer's written instructions. The Contractor shall thoroughly sweep 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.

Permanent pavement message and symbol markings shall be installed using Type B, Class I or Class II thermoplastic material as specified in the Contract Documents. Messages and symbol markings shall include, but not be limited to: crosswalks, yield lines, stop lines, school markings, railroad crossing markings, accessible (handicapped) parking symbols, arrows, word messages, etc.

1. **Type A Markings:** Paint shall be applied as per the manufacturer's installation instructions. Paint shall not be applied over existing pavement markings of other materials unless the existing marking is at least 90 percent worn away or eradicated. Paint may be applied over existing Type A paint markings if the existing paint is clean and well adhered.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

The Contractor shall apply paint with a line painting machine that is capable of hot spraying paint and glass beads directly onto the pavement surface for widths of 4 through 8 inches. The machine shall be capable of simultaneously applying two pavement stripes, either solid or skip, at the same time when double line markings are required. Paint tanks on the equipment shall be equipped with a mechanical agitator and paint shall be thoroughly mixed and heated such that it will not track within 60 seconds after its application.

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

Glass beads shall be applied by the application equipment to the entire surface of the paint at the minimum rate of 6 pounds per gallon of paint, unless specified otherwise in the VDOT Materials Division's *Approved Products List*.

2. **Type B Markings (General):** Type B markings shall be applied in accordance with the manufacturer's installation instructions. Type B markings shall not be applied over existing pavement marking materials unless the existing marking is at least 90 percent worn away or eradicated.

The Contractor shall furnish a properly calibrated infrared instrument for the purpose of measuring the actual temperature of molten thermoplastic material. Multi-component material shall be applied using internally injected guns for the proper mixing of components.

Truck mounted equipment for application of liquid long line Type B markings shall be capable of hot spraying liquid applied markings and glass beads uniformly over the entire surface of the marking for widths of 4 through 8 inches. Equipment tanks shall be equipped with a mechanical agitator and materials shall be thoroughly mixed, heated and applied in accordance with the manufacturer's installation instructions. Equipment shall be capable of applying two pavement stripes, either solid or skip, at the same time when double line markings are required.

3. **Thermoplastic (Type B, Class I) Markings:** Material shall be applied by screed extrusion, ribbon gun, or spray equipment. Alkyd thermoplastic may be applied directly to plant mix surfaces after the paving operations if the paved surface can support the equipment; however, hydrocarbon thermoplastic shall be applied between 30 and 45 days after the paving operations.

Alkyd and hydrocarbon materials shall not be mixed together. Equipment shall be thoroughly cleaned before color or types of material are changed.

Thermoplastic shall only be applied over existing thermoplastic markings if the existing thermoplastic marking is clean, chalk-free (not powdery), and well-adhered; or over previously-applied Type F-paint that is fully dry and is at a thickness of 10 mils or less.

Glass beads shall be applied by the application equipment to the surface of the marking at the minimum rate of 7 pounds per 100 square feet, unless specified otherwise in the VDOT Materials Division's *Approved Products List*.

Non-truck mounted equipment for application of thermoplastic material shall be of the screed extrude type with a screw drive and shall be self-propelled and regulated to allow for calibration of the amount of material applied.

Type B, Class I hydrocarbon thermoplastic material shall not be used for the installation of messages or symbols.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Alkyd thermoplastic material shall only be applied by screed extrude application equipment for the installation of messages or symbols.

4. Preformed Thermoplastic (Type B, Class II) Markings:

When markings are installed on hydraulic cement concrete pavement, a primer/sealer shall be first applied in accordance with manufacturer's installation instructions.

Additional glass beads shall be applied evenly at the rate of 7 pounds per 100 square feet to flood the entire surface of the preformed thermoplastic material immediately after installation and while the material is still molten.

5. Epoxy Resin (Type B, Class III) Markings:

Markings shall be applied per the manufacturer's recommendations. Epoxy resin shall not be applied over existing pavement markings unless the existing marking is at least 90 percent worn away or eradicated. Non-truck mounted equipment for application of epoxy resin material shall be self-propelled and regulated to allow for calibration of the amount of material applied.

6. Plastic-Backed Preformed Tape (Type B, Class IV) Markings:

Markings shall be installed per the manufacturer's installation instructions and as denoted herein.

Unless otherwise specified, Tape applied to freshly paved asphalt surfaces shall be inlaid on the freshly installed asphalt surface before the pavement mat has cooled below 100 degrees F.

Surface preparation primer/adhesive shall be used to enhance adhesion in accordance with the manufacturer's recommendations, except when tape is inlaid immediately following the final rolling of the new asphalt concrete surface.

New surface treatment, slurry seal, and latex emulsion surfaces shall be fully cured and temporary markings worn in accordance with manufacturer recommendations prior to installation of the primer/adhesive and surface application of the Tape.

Tape for pavement line markings shall be applied by an application cart as recommended by the manufacturer. Tape shall be tamped into place with a tamper cart with a weight as recommended by the manufacturer. Vehicle wheels may be used to tamp line markings if recommended by the manufacturer's installation instructions. If vehicle wheels are used to tamp the markings, then the Contractor shall ensure that the vehicle tires ride true down the length of the tape marking.

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.

7. Patterned Preformed Tape (Type B, Class VI) Markings:

Pre-approved material shall be installed either under the guidance of the manufacturer's representative or by the contractor's employee that is approved as an installer by the manufacturer. If the material is no longer approved for Surface Treatment applications (Latex Emulsion, Slurry, etc.) at the time of bid advertisement, the material shall not be installed on Surface Treatment applications (Latex Emulsion, Slurry, etc.).

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

The pavement marking tape shall be warranted by the manufacturer against failure resulting from improper installation and material defects regardless of method of manufacturer's prescribed application or pavement type. The material shall be warranted to retain its color, retroreflectivity, adherence to the pavement and shall be free of other obvious defects or failures.

All pavement marking tape that has failed to meet the warranty conditions shall be replaced at no additional cost to the Department. The warranty shall cover all pavement striping materials (regardless of method of installation), labor, equipment, mobilization\demobilization, tools, and incidentals required to remove (eradicate) and replace the pavement striping, including maintenance of traffic during the removal and reinstallation operations. The warranty shall include the following:

- Retroreflectivity: White and Yellow longitudinal pavement marking tape shall remain effective for its intended use under normal traffic conditions and meet the minimum Coefficient of Retroreflected Luminance (RL) of 100 millicandelas per square foot per foot-candle [(mcd-ft²)-fc⁻¹] when measured in accordance with the requirements of ASTM E 1710 for six years.
- Color: Longitudinal pavement marking tape shall remain effective for its intended use under normal traffic conditions and meet the minimum Daytime and Nighttime color including Luminance Factor (Cap Y) per ASTM D 6628 for six years when inlaid on new asphalt concrete pavement or surface applied on existing asphalt concrete pavement or hydraulic cement concrete.
- Material Loss for Solid Longitudinal Lines: more than five percent of the substrate is exposed in any 2000 ft. section of pavement marking or 50 ft. or more of continuous loss.
- Material Loss for Skip Line: more than five percent of the substrate is exposed in any 2000 ft. section of pavement marking, or the loss of two consecutive skips.

When Type B, Class VI markings are specified for a paving schedule route that includes a concrete bridge deck greater than 75 feet in length within the paving schedule's limits, Type B Class VI contrast (black-bordered) tape shall be surface-applied on the concrete bridge deck for the lane lines and edge lines unless otherwise specified in the Contract Documents or directed by the Engineer.

Plant Mix Surfaces: Type B, Class VI markings applied to plant mix overlay surfaces shall be installed as per manufacturer's installation instructions, except that non-embedded (adhesive) surface application will not be permitted; the markings shall be inlaid in the freshly installed asphalt surface before the pavement mat has cooled. The temperature of the asphalt mat shall be between 100 and 180 degrees. The Type B, Class VI markings shall be inlaid with a roller (minimum 2 tons) operating in a non-vibratory mode when the asphalt mat is between 100 and 180 degrees. The Contractor shall ensure that markings are not degraded by subsequent paving and shoulder 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.

Non-Plant Mix Surfaces: 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.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

When Type B, Class VI markings are to be installed on latex emulsion or other approved surface treatment, the selected marking material shall be a material that is warranted by the manufacturer and pre-approved by the Department for application on slurry seal/latex emulsion surfaces.

Prior to tape installation on new latex emulsion surfaces, the following shall occur:

- The surface shall cure for at least 30 days unless otherwise documented that the pavement surface has sufficiently cured as specified herein.
- The surface shall be swept clear of all loose aggregate immediately prior to applying (spraying) surface preparation primer adhesive.
- The primer adhesive shall be applied (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 proper 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.

8. Polyurea (Type B, Class VII) Markings:

Markings shall be installed in accordance with the manufacturer's installation instructions, either under the guidance of the manufacturer's representative or by a Contractor's technician that has received manufacturer's certification.

704.05—Pavement Markers

The type, installation procedures, time limits, ambient air temperature, ambient moisture condition, and pavement surface condition for pavement markers shall be in accordance with manufacturer's installation instructions. A copy of those installation instructions shall be provided to the Engineer prior to installation.

The front side (the side facing oncoming traffic) of pavement markers retroreflectors shall be the same color as the adjacent pavement marking. The backside of the pavement marker retroreflectors shall be as follows:

- One-way markers: The backside (the side facing wrong-way traffic) shall be red for pavement markers with a white retroreflector on the front side.
- Two-way markers: The backside shall match the color of the adjacent pavement marking.

The bonding material shall be from the VDOT Materials Division's *Approved Products List* for the specific marker listed.

The Contractor shall prepare the pavement surface by air blowing or a thorough brushing as necessary to ensure that the pavement surface is free of dirt, dust, debris, moisture, scale, oil, and any contaminant that might reduce bonding.

The retroreflector surface shall be kept free of moisture, scale, dirt, oil, grease, and other contaminants that might reduce the retroreflectivity of the retroreflector.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

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

(a) Flexible Temporary Pavement Markers (FTPMS):

The Contractor may choose to substitute FTPMS in lieu of Type F-temporary paint or in lieu of Type D temporary pavement markings. Prior to installing FTPMS the Contractor shall submit a plan for substituting FTPMS for temporary pavement markings to the Engineer for approval. The Contractor's plan for FTPMS shall be in accordance with the requirements and the *Typical Plan for FTPM Placement* drawings included herein.

When FTPMS are used to simulate temporary edgelines, the FTPMS shall be placed on 20-foot centers and shall match the color of the line markings being simulated.

FTPMS 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 FTPMS 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 FTPMS 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 FTPMS 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 FTPMS until the permanent pavement markings are installed. Damaged or missing FTPMS shall be immediately replaced at the Contractor's expense with new FTPMS 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 FTPMS may be damaged or missing on any measured 100-foot segment of simulated solid line.

Once applied, FTPMS 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. FTPMS may remain in place, undamaged, after installation for up to 14 consecutive days. When FTPMS 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 FTPMS, not at the time of surface placement. The Engineer may approve an extension of the 14 days if all damaged FTPMS are replaced and the remaining FTPMS are maintained.

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

(b) Snow-plowable Raised Pavement Markers (SRPMs):

SRPMs shall be installed by cutting two parallel grooves into the pavement at the depth and dimensions recommended by the marker manufacturer. Grooves shall be parallel to the adjacent

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

pavement marking. Grooves shall be cut with saw blades having a diameter to match the curvature of the steel casting bottom and keels. Keel surfaces and the cut grooves shall be free from moisture, scale, dirt, oil, grease, debris, or any other contaminant that might reduce bonding.

SRPMs shall be located at least two inches away from any joint, crack, or seam.

Casting keels shall be bonded in the saw-cut grooves in accordance with the manufacturer's installation instructions. Front and rear keel tips of the casting shall be installed flush with or below the pavement surface. The installed height of the raised pavement marker shall be approximately ¼ inch to ½ inch above the pavement surface.

The top of retroreflectors shall be mounted flush with or below the top of the casting.

If the SRPM retroreflectors are dirtied or damaged during installation (including dirtying from adhesive residue), they shall be replaced by the Contractor at no additional cost to the Department.

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 for installation of SRPMs shall be determined as follows:

- On a two-lane roadway, the time limit commences for the entire roadway at the end of the last workday that the final surface is placed on a continuous section of that roadway.
- On a divided highway or a multi-lane undivided highway, the time limit commences for the entire roadway at the end of the last work day that the final surface is placed on a continuous section for that portion [direction] only. The time limit for the entire roadway in the opposite direction does not commence until at the end of the last work day that plant mix or surface treatment is placed on a continuous section for that opposite direction.

(c) Raised Pavement Markers:

Raised pavement markers shall be bonded to the pavement surface in accordance with the manufacturer's installation instructions.

(d) Pavement Marker Retroreflector Replacement:

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 of the Specifications.

704.06—Quality Control

The Contractor shall have a certified Pavement Marking Technician present during all temporary and permanent pavement marking operations and marker installation operations, except FTPM operations.

The Contractor shall maintain a daily log (Form C-85) for both temporary and permanent markings and markers. The C-85 form shall not be modified, all entries in the log shall be in ink, the log shall be legible

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

and complete, and the log shall be signed by the Contractor and delivered to the inspector at the end of each workday. If the Form C-85 is in electronic format, it shall be kept current with VTM-94 testing throughout the day and a printed copy signed by the Contractor shall be delivered to the Inspector at the end of each workday. The Contractor shall also provide a printed or electronic copy of the signed Form C-85 to the Materials Quality Assurance Technician for materials notebook verification.

The Contractor shall perform quality control testing for application thickness and glass bead rate in accordance with VTM-94 at the beginning of each workday and every 3 hours thereafter. The Contractor shall be responsible for providing the apparatuses indicated in VTM-94 that are needed to perform the quality control testing. Testing for compliance with VTM-94 shall be performed in the presence of the Engineer and shall be documented on the Form C-85 immediately after testing is completed. If requested by the Engineer, the Contractor shall provide a Quality Control (QC) test plate and the provision of the test plate shall be documented on Form C-85.

The Engineer will make a visual evaluation of the permanent markings and markers to assess the condition, retroreflectivity, and color of the pavement marking material, after installation but prior to final acceptance. If problem areas are found, a further inspection will be made by the Department, the Contractor, and marking manufacturer's representative to identify specific areas of concern. When required by the Engineer, the suspect areas shall be tested by the Contractor in the presence of the Engineer in accordance with VTM-125 to define the evaluation sections and the number of measurements needed. The test results shall meet the requirements for retroreflectivity and color specified in Section 246 of the Specifications. Those markings found to be less than the Initial Approval values in Section 246 of the Specifications shall be eradicated and immediately replaced by the Contractor at no cost to the Department. Pavement markings that exhibits signs of significant tearing, roll back, lifting, shrinkage, or other signs of poor adhesion shall be immediately replaced by the Contractor at no cost to the Department.

All costs associated with testing the marking material for retroreflectivity, color, and adhesion shall be borne by the Contractor. The Contractor will be paid for Maintenance Of Traffic during this testing at the contract unit price for the Maintenance Of Traffic items used.

Commercially standard material guarantees that are furnished by the manufacturer shall be obtained by the Contractor and assigned to the Commonwealth in writing prior to final acceptance.

704.07—Measurement and Payment

Pavement line markings will be measured and paid at the contract unit price per linear foot for the type and/or 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.

The Schedule of Items may contain permanent pavement marking bid items designated as "Bonus" in addition to the regular permanent pavement marking bid items. This "Bonus" designation indicates an adjustment of 1.25 to be made to the regular Contract unit bid price for the designated item in accordance with Section 102.05 of the Specifications which is to be paid to the Contractor if the conditions specified herein are met. For items with the "Bonus" designation the Contractor will be paid at the adjusted price instead of at the regular bid price for the linear foot of permanent pavement marking installation completed if the following conditions are met:

- **Plant Mix:** Pavement markings (not including Type B, Class VI) are installed on Plant Mix surfaces within 14 days or less after the last day of paving.
- **Non-Plant Mix:** Pavement markings (not including Type B, Class VI) are installed on **Non-Plant** Mix surfaces within 21 days or less after the last day of paving.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Pavement message markings will be measured and paid for at the contract unit price per each per location or linear foot as applicable for the message, size, and type and/or class 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.

Temporary pavement line markings will be measured and paid for at the contract unit price per linear foot for the type and/or class and width specified. This price shall include furnishing, installing, and maintaining the pavement marking material, surface preparation, quality control tests, daily log, guarding devices, primer/adhesive, glass beads, and disposal.

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 to apply the temporary markings to a visibly wet surface at the direction of the Engineer as specified herein.

In the event the Contractor uses FTPMs in lieu of Type F-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 F-temporary paint unit price. That measurement shall represent all FTPMs required for that simulated line marking. This cost shall include furnishing, installing and maintaining the FTPMs, removable covers, surface preparation, quality control tests, daily log, guarding devices, FTPMs removal, and disposal.

Temporary pavement message markings will be measured and paid for at the contract unit price per each per location or per linear foot as applicable for the message, size and type and/or class specified. This price shall include furnishing, installing, and maintaining the pavement marking material, surface preparation, quality control tests, daily log, guarding devices, primer/adhesive, glass beads and disposal.

If temporary pavement message 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 to apply the temporary markings to a visibly wet surface at the direction of the Engineer as specified herein.

Pavement Markers will be measured and paid for at the contract unit price per each for the type specified. This price shall include surface preparation, furnishing and installing prismatic retroreflectors and castings, pavement cutting, adhesive, guarding devices, quality control tests, daily log, and manufacturer's warranty.

Pavement Marker Retroreflector Replacement will be measured and paid for at the contract unit price per each 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.

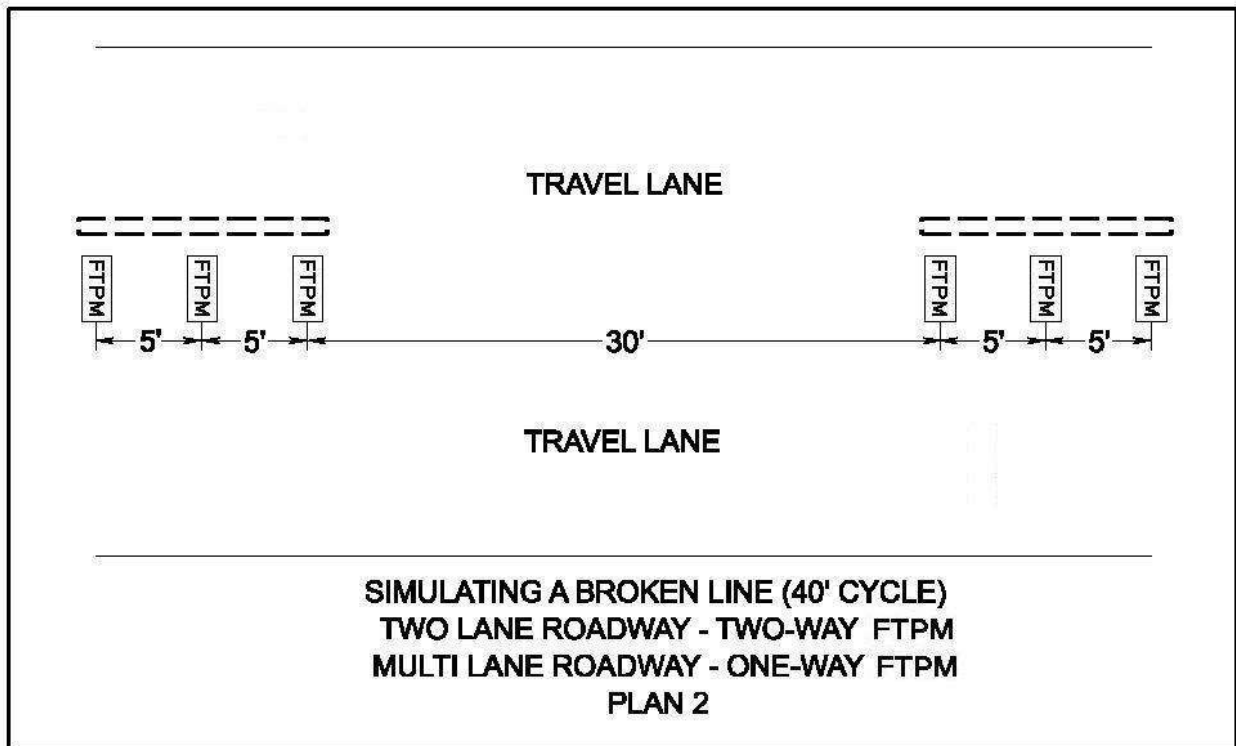
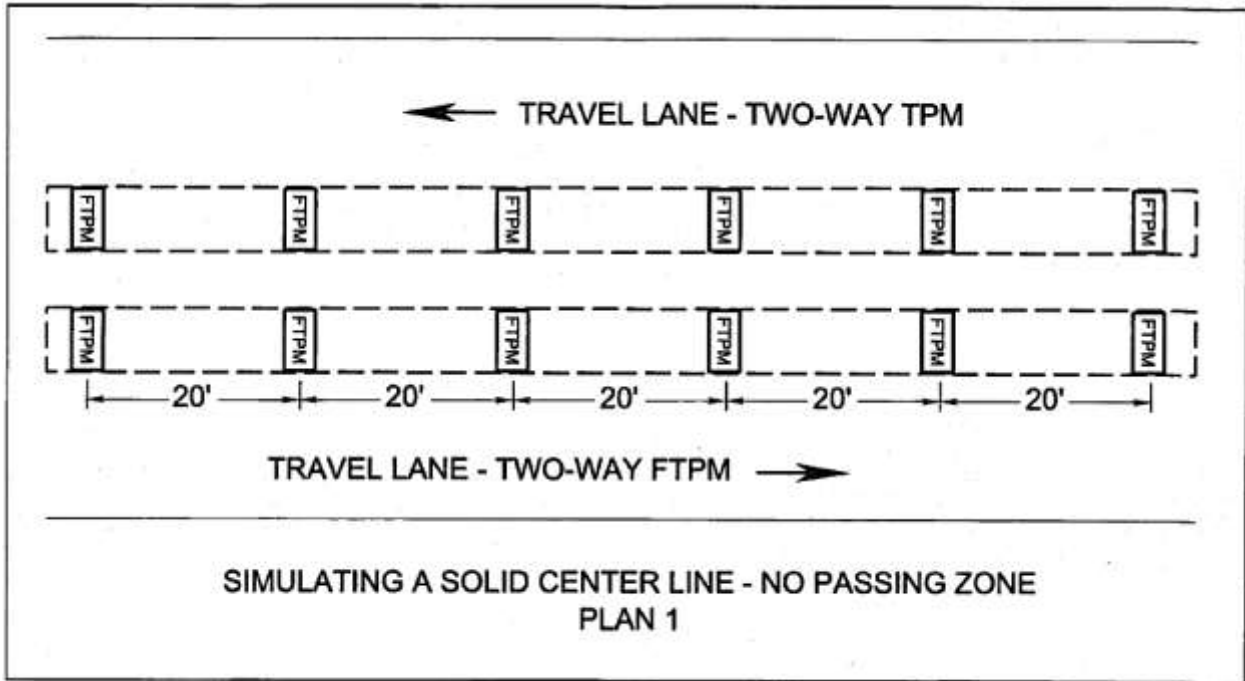
Payment will be made under:

| Pay Item | Pay Unit |
|---|---------------------|
| Pavement line marking (Type and/or class and width) | Linear foot |
| Pavement message marking (Message, size, type and/or class) | Each or linear foot |
| Temporary pavement line marking (Type and width) | Linear foot |
| Temporary pavement message marking (Message, size, type and/or class) | Each or linear foot |
| Pavement marker (Type, []-way, and/or type pavement) | Each |
| Pavement marker retroreflector replacement (Type) | Each |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

TYPICAL PLAN FOR FTPM PLACEMENT



*These SPECIFICATIONS REVISIONS are subject to change on short notice.

**GUIDELINES — FOR PROJECTS REQUIRING TYPE B, CLASS VII POLYUREA PAVEMENT LINE MARKING.
INCLUDE: SS70402 Pavement Markings and Markers.**

S704N00-1211

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
TYPE B, CLASS VII POLYUREA PAVEMENT MARKINGS

October 17, 2011

I. Description

This work shall consist of furnishing and installing white and/or yellow polyurea pavement line markings at locations shown on the plans and as directed by the Engineer.

II. Materials

Polyurea pavement line markings shall be a retro-reflective polymer material consisting of a mixture of polymeric materials, pigments and glass beads and/or reflective optics.

The polyurea material shall not be formulated with any compounds of the heavy metals listed in 40 CFR 261.24 Table 1 except that barium sulfate is allowed. Total heavy metals, with the exception of barium sulfate, shall not exceed 20 times the specified regulatory limits.

The polyurea coating shall be formed by the reaction of at least two components (Part A and Part B). The components shall be formulated such that the proper cure occurs when they are mixed at the times of the application.

The polyurea material shall be capable of application on new and existing asphalt and hydraulic cement concrete surfaces at pavement surface temperatures of 40 degrees Fahrenheit and above. The polyurea material shall maintain its original dimensions and placement without chipping, spalling, shrinking, cracking, bleeding or discoloring (fading) or other signs of poor performance which will impair the intended use of the marking throughout its intended service life.

The polyurea material shall not deteriorate due to contact with sodium chloride, magnesium chloride, calcium chloride, mild alkalies and acids, or other ice control materials, oil in the pavement material, or oil and gasoline drippings from vehicles.

Materials that must be heated for application shall not exude fumes that are toxic or injurious to persons or property when heated to the application temperature.

A. Initial Approval Requirements:

Specific Polyurea pavement markings will be included on the Department's Materials Approved Products List # 74 after the Department determines conformance to these specifications. Determination of conformance will include, but will not be limited to, the evaluation of test data from AASHTO's National Transportation Product Evaluation Program (NTPEP) on a Northern region test deck or other VDOT approved facilities.

If tested through AASHTO/NTPEP, the polyurea material shall have been installed, tested, and met the following requirements on both asphalt and concrete surfaces. If tested on another VDOT approved facility, VDOT reserves the right to test and approve based upon in service performance data on either asphalt, hydraulic cement concrete, or both surfaces.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

AASHTO/NTPEP Testing - Test data values used for approval shall be based upon the data generated per the NTPEP, Pavement Marking Material (PMM) Work Plan.

VDOT Test Facility – Test data values used for approval shall be based upon the data generated by following: Virginia Test Method (VTM)-125 to define the evaluation sections and number of measurements needed, evaluation of Durability, and No Track Time based upon field performance, VDOT lab testing or third party testing for compliance.

The manufacturer shall certify each batch or lot of material supplied is the same product (binder and reflective optics) that was tested and approved on the NTPEP or VDOT test facility in accordance with the Materials Division, Manual of Instructions for Certification II materials.

1. Retroreflectivity:

Markings shall have the following retroreflectance values when measured in accordance with the requirements of ASTM E 1710 (outside of the wheel path). The photometric quantity to be measured shall be Coefficient of Retroreflected Luminance (R_L) and shall be expressed as millicandelas per square foot per foot-candle $[(mcd \cdot ft^{-2}) \cdot fc^{-1}]$.

| Coefficient of Retroreflected Luminance (R_L) ($mcd \cdot ft^{-2} \cdot fc^{-1}$) | | |
|--|-------------|--------------------------|
| Color | New* | 1 Year In-Service |
| White | 400 | 300 |
| Yellow | 300 | 200 |

* New Coefficient of Retroreflected Luminance value may be either the 0 or the 1 month reading, whichever is higher.

2. Day and Nighttime Color:

Daytime and Nighttime color including Luminance Factor (Cap Y) shall conform to the requirements of ASTM D 6628 initially and after 1 year. Color and Luminance Factor values for NTPEP acceptance will be from outside of the wheel path. Night color may be measured in accordance with VTM-111 or with portable night color instrumentation per ASTM D 6628.

3. Durability Rating:

The marking shall have a durability rating of at least 4 (40% retained) when determined in the wheel path area after 1 year when tested in accordance with NTPEP guidelines.

4. No Track Time:

When applied in accordance with manufacturer's instructions at 20 +/- 1 mils wet film thickness with reflective optics, the polyurea shall exhibit a no-track time of 10 minutes maximum when tested in accordance with ASTM D711.

III. INSTALLATION:

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Marking configurations shall be in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices". Markings shall be applied in strict accordance with the manufacturer's recommendations either under the guidance of the manufacturer's representative or by the manufacturer's certified installer. Markings shall not be installed directly over longitudinal pavement joints.

IV. POST-INSTALLATION EVALUATION

Following installation and prior to final acceptance, a visual evaluation will be made by the Engineer to assess the condition, retroreflectivity and color of the polyurea marking material. If problems areas are found, an inspection will be made by the Department, the Contractor, and the polyurea manufacturer's representative to identify the specific areas of concern. If needed, the suspect areas shall be tested by the Contractor and/or VDOT representative in accordance with VTM-125 to define the evaluation sections and number of measurements needed. Acceptable test results shall meet the requirements for retroreflectivity and color specified in Section II, A – Initial Approval Requirements. Those markings found to be less than the values listed in Initial Approval Requirements for Retroreflectivity and Day and Nighttime Color (1 Year, In-Service) shall be eradicated and replaced by the Contractor at no cost to the Department. All costs associated with testing the pavement marking for retroreflectivity,color, and adhesion, including the cost of maintenance of traffic, shall be borne by the Contractor.

VI. MEASUREMENT AND PAYMENT

Type B, Class VII, Polyurea pavement line marking will be measured in linear feet for the width specified and will be paid for at the contract unit price per linear foot, which price shall be full compensation for furnishing and installing pavement line markings, surface preparation, and testing.

Payment will be made under:

| Pay Item | Pay Unit |
|--|-------------|
| Type B, Class VII Polyurea pavement line marking | Linear foot |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES — PROJECTS REQUIRING SIGNS, SIGNALS, LIGHTING OR NAVIGATIONAL LIGHTS.

SS70005-0815

April 15, 2015

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 700—GENERAL****SECTION 700—GENERAL** of the Specifications is amended as follows:**Section 700.02(g)** is replaced with the following:

- (g) **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.

Section 700.02(i) is amended to replace “**Poles, posts, and overhead and bridge-mounted sign structures**” in the first sentence with “**Poles, posts, and overhead sign structures**”.

Section 700.02(i) is amended to replace 1, 2, 3, and 4 and the next three paragraphs including the bullets with the following:

1. **Conventional and offset lighting poles** shall be steel or aluminum.
2. **Overhead sign structures, signal poles (mast arm and strain), and high-mast lighting poles** shall be steel.
3. **Pedestal poles** with a nominal diameter of more than 2 inches shall be steel or aluminum. Pedestal poles 2 inches and less in nominal diameter shall conform to the requirements of Section 238 for metal conduit.
4. **Wood for wooden posts and poles** shall conform to Section 236 and shall be treated in accordance with Section 236. Wood items shall be cut to size or design before treatment.
5. **Ground Mounted Sign Structures** shall be fabricated from galvanized steel. Square tube posts shall conform to the requirements of ASTM A1011, Grade 50 except the yield strength after cold-forming shall be 60,000 psi minimum for 12 and 14 gage and 55,000 psi minimum for 10 gage posts. Posts (inside and outside) shall be galvanized in accordance with the requirements of ASTM A653, Coating Designation G-90. Square tube sign posts shall have 7/16-inch (+/- 1/64-inch) openings or knockouts spaced 1-inch on centers on all four sides.

The design of traffic control device structures and foundations shall conform to the requirements of the edition of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* specified in the Structure & Bridge Division S&B-IIM-90 Memorandum (VDOT Modifications to AASHTO's *Standard Specifications*) in effect at the time of advertisement.

Steel poles, posts, and overhead sign structures shall be hot-dip galvanized after fabrication. Except when shop painting is required, steel poles and posts shall be given one shop coat of primer and two field coats of paint and the galvanization finish of overhead sign structures shall be field treated for paint retention and two coats of paint applied.

Section 700.02(k) Breakaway Support Systems is replaced with the following:

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Breakaway support systems shall be tested and certified to conform to the requirements of NCHRP Report 350, or be Manual for Assessing Safety Hardware (MASH) certified. The Contractor shall provide a certification letter stating the brands and models of breakaway systems planned for use have been tested and are in conformance with this requirement. Breakaway couplers shall not be used. The following systems shall be used when breakaway supports are specified on the plans:

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

Section 700.04(a)1. Grounding Electrodes is amended to replace the seventh paragraph with the following:

- The Contractor shall install a junction box at the primary grounding electrode location for access to the electrode for connection and testing. Grounding electrode conductors shall be installed under the bottom flange of the junction box. The grounding electrode shall be centered in the bottom of the junction box with a minimum of 6 inches exposed. The junction box cover shall have the letters "VDOT ELEC" cast in the depression on the top.

Section 700.04(a)2. Grounding electrode testing is replaced with the following

2. **Grounding electrode testing:** The Contractor shall test the primary grounding electrodes after each 10-foot grounding electrode and/or section thereof is installed using the fall of potential (three-point measurement) method. After the primary grounding electrode is installed and tested, the Contractor shall connect to the augmented electrode(s) to conduct a system test. The Contractor shall disconnect the grounding electrode conductor from the service equipment ground bus and bonding bushing before testing the grounding electrodes/system. The Contractor shall test the grounding electrode as required by the manufacturer's instructions for the type of earth testing equipment. The Contractor shall record the readings on a form provided by the VDOT Regional Traffic Engineering Office. The completed form shall be signed and submitted to the Engineer after installation of the electrical service grounding system.

Section 700.04(c) Concrete Foundations is amended to replace the third paragraph with the following:

The Contractor shall furnish the foundation designs for signal poles, high-mast lighting poles, and overhead sign structures to the Engineer for review and acceptance. Designs shall indicate the cubic yard quantity of concrete required for constructing the foundations. Foundations shall be designed for the structure it is supporting and the proposed loads shown on the plans.

The Contractor shall perform at least one test bore, as approved by the Engineer, at each foundation location to determine the subsurface conditions of the proposed site before designing the foundation. Test bores shall be performed in accordance with any of the following three referenced methods:

1. ASTM D 420, ASTM D 1452, and ASTM D 1586.
2. ASTM D 3441.
3. ASTM D 4719.

Section 700.04(g)1. Electrical service and lighting conductor identification is amended to replace the fifth paragraph with the following

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

2-wire circuits, 120 Volts; 3-wire circuits, 120/240 Volts; 3-phase, 4-wire wye circuits, 208/120 Volts and; 3-phase, 4-wire delta circuits, 240 Volts

| Circuit Designation | Color Code |
|-------------------------------|--|
| Phase A or Line A | Black |
| Phase B or Line B | Red or orange* |
| Phase C | Blue |
| Grounded Conductor (Neutral) | White or gray** (see exception above) |
| Equipment Grounding Conductor | Bare, green, or green with one/more yellow stripes |

3-phase, 4-wire wye circuits, 480/277 Volts; 3-phase, 3-wire delta circuits, 480 volts

| Circuit Designation | Color Code |
|-------------------------------|--|
| Phase A | Brown |
| Phase B | Orange |
| Phase C | Yellow |
| Grounded Conductor (Neutral) | White or gray** (see exception above) |
| Equipment Grounding Conductor | Bare, green, or green with one/more yellow stripes |

* For 3-phase, 4-wire delta circuits, Phase B shall be the high leg and shall be orange.

** For outer covering of conductors of different systems that is contained within the same enclosure, refer to Article 200 of the NEC.

Section 700.04(h) Conduit Systems is amended to include the following:

The Contractor shall install a bushing to protect the conductor cable from abrasion when a conduit enters a junction box, fitting, or other enclosure, unless the design of the junction box, fitting, or enclosure is such as to afford equivalent protection of the conductor cable.

Section 700.04(h)2. Buried conduit systems is amended to replace the second paragraph with the following:

The Contractor shall install conduit by the use of an approved directional boring method when conduit is to be installed under an existing roadway, entrance, or fixed object and open cutting is not allowed. Conduit for the directional boring method shall be Polyvinylchloride (PVC) or High-Density Polyethylene (HDPE) designed specifically for the directional boring operation. When the plans show more than one conduit at a location to be installed by directional boring, with the Engineer's approval the Contractor may elect to install multiple conduits into a single bore at no additional cost to the Department.

| MAXIMUM PILOT OR BACK REAMER BIT DIAMETER WHEN ROTATED 360^o | |
|---|---|
| NOMINAL INSIDE PIPE DIAMETER INCHES | BIT (REAMER) DIAMETER INCHES |
| 1 - 2" | 4" BORE HOLE |
| 2 - 2" | 5" BORE HOLE |
| 3 - 2" | 8" BORE HOLE |
| 1 - 3" | 5" BORE HOLE |
| 2 - 3" | 6 ½ " BORE HOLE |
| 3 - 3" | 8" BORE HOLE |
| 1 - 4" | 6 ½ " BORE HOLE |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

The Contractor shall use an Engineer approved stabilizing agent mixed with potable water to create the drilling fluid (mud slurry) for lubrication and soil stabilization. The fluid viscosity may vary to best fit the soil conditions encountered. The Contractor shall not use any chemicals or polymer surfactants in the drilling fluid without written consent from the Engineer. The Contractor shall certify to the Engineer in writing that any chemical added to the drilling fluid is environmentally safe and not harmful or corrosive to the conduit system.

The Contractor may elect to use the jacked method to install a pipe sleeve for installation of the required conduit at no additional cost to the Department.

If an obstruction is encountered during the directional boring or jacking operation that requires abandonment of the bore hole, the Contractor shall immediately backfill the hole with flowable fill for its full length at no additional cost to the Department.

Section 700.04(i) Junction Box Covers is replaced with the following:

(i) **Junction Boxes** shall be installed as follows:

The Contractor shall excavate the junction box site to a depth equal to the height of the junction box plus at least 12 inches to allow for the installation of aggregate bedding material. The width of the excavation shall be 6 to 8 inches wider than the junction box to allow proper aggregate backfill.

Bedding material shall conform to Section 203 and be No. 68, No. 78, or No. 8 aggregate or crushed glass conforming to No. 78, or No. 8 gradation requirements. Aggregate shall be at least 12 inches in depth and entirely cover the bottom of the excavated area for the junction box. The Contractor shall level and tamp the bedding aggregate to compact it prior to installing the junction box.

Junction boxes shall be installed and leveled to grade prior to backfilling.

Prior to backfilling the interior of polymer concrete junction boxes (JB-S1, JB-S2 and JB-S3) shall be braced with 2 inch by 4 inch lumber using two braces across the width and one brace across the length of the box or braced as required by the junction box manufacturer. Bracing shall be installed to facilitate removal once backfilling and compaction activities have been completed. The Contractor shall remove internal bracing after backfilling and compacting operations have been completed.

The cover of the junction box shall be installed prior to backfilling.

The junction box shall be backfilled and compacted around its perimeter utilizing six to eight inch horizontal lifts to the elevation where the concrete collar is to begin. Once the concrete collar has cured the remaining area around the collar shall be backfilled and compacted as stated above. Compaction density shall be to at least ninety percent of the theoretical maximum density as defined in Section 101.02 of the Specifications. The Contractor shall use a mechanical tamping device to compact the backfill material and soil, layer by layer around the perimeter of the junction box. The wheel of a backhoe or other type vehicle shall not be used for compaction of backfill and soil. The internal bracing shall be removed after backfilling and compaction have been completed. The area around the junction box shall be graded and restored according to the plans and as stated in the pertinent Specifications.

Junction boxes shall not be installed or backfilled where there is standing water. Backfill material shall be free of large stones, wood or other debris and shall not be saturated with water.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

If a special tool or wrench is required to remove the junction box cover, the Contractor shall furnish the Engineer with five such tools.

Section 700.04—Procedures is amended to include the following:

(k) **Anchor Bolts**

Foundations for traffic control devices shall have a bolt template positioned for the correct orientation of the structure with respect to the structure's location and roadway alignment and to maintain the anchor bolts vertically (plumb) and level during construction.

Bolt and/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.

The threaded portion of the anchor bolts shall be lubricated with beeswax, the bolt manufacturer's recommended lubricant, or other lubricant as approved by the Engineer to assist in proper tensioning before the structure is installed.

Double-nut connections installation procedure: A minimum of three nuts and two hardened washers shall be provided for each anchor bolt.

1. If anchor bolt(s) are not plumb (vertical), determine if beveled washer(s) may be required prior to erection of the structure. Beveled washers shall be used on top of the leveling nut and/or under the first top nut if any face of the base plate has a slope greater than 1:20 and/or if any nut could not be brought in firm contact with the base plate.
2. Clean and lubricate the exposed thread of all anchor bolts, nuts, and all bearing surfaces of all leveling nuts. 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 one inch (1").
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 one (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.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

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 criteria from step 1. If a beveled washer is required, remove the structure if necessary, add the beveled washer(s) 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 1 using a star pattern. Rotate the first top nuts again, using a star pattern, to the full required nut rotation specified in Table 1. For example, if total rotation from snug tight is 1/6 turn (60°), rotate 30° in each cycle.

Table 1

| Anchor Bolt Diameter, (in.) | Nut Rotation beyond Snug - Tight | |
|------------------------------------|---|-------------------------------------|
| | ASTM F 1554 Grade 36 (M314) | ASTM F 1554 Grade 55 (M 314) |
| ≤1½ | 1/6 turn (60°) | 1/3 turn (120°) |
| >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.

The Engineer will not permit the use of lock nuts and/or split washers 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 as provided in Table 2 has been achieved. A minimum of every other bolt shall be inspected.

Table 2

| Anchor Bolt Diameter, (in.) | Verification Torque | |
|------------------------------------|--|---|
| | ASTM F 1554 Grade 36 (M314) Tension/Torque kips/ft-lbs. | ASTM F 1554 Grade 55 (M 314) Tension/Torque kips/ft-lbs. |
| 1 | 18 / 180 | 27 / 270 |
| 1 ¼ | 28 / 350 | 44 / 550 |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

| | | |
|-------------------------------|--------------|--------------|
| 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 |

12. Install second top nut on each bolt to snug tight.
13. 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 VDOT Materials Division. A copy of the report for structures with and without indications shall be submitted to the District Bridge Office and the Engineer.

Section 700.05—Measurement and Payment for Overhead and bridge-mounted sign structures is replaced with the following:

Overhead sign structures will be measured in units of each and will be paid for at the contract unit price per each. This price shall include structural units and supports, hand holes and covers, grounding lugs, electrical systems including conduit and fittings, and identification tags.

Section 700.05—Measurement and Payment for, Junction boxes is replaced with the following:

Junction boxes will be measured in units of each and will be paid for at the contract unit price per each. This price shall include concrete collars, frames and covers, tools to remove the cover, ground rods, ground conductors, grounding lugs, knockouts, cable racks, bracing, aggregate, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring disturbed areas.

Section 700.05—Measurement and Payment for Sign Posts is replaced with the following:

VA sign posts will be measured in linear feet for the size specified and will be paid for at the contract unit price per linear foot for the size specified. This price shall include posts, clamps, identification tags, foundation stub post, and breakaway base assemblies.

VIA sign posts will be measured in linear feet for the size specified and will be paid for at the contract unit price per linear foot for the size specified. This price shall include posts, clamps,

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

identification tags, foundation stub post, breakaway base assemblies, hinge plate assemblies and fuse plate assemblies.

Square tube sign posts will be measured in linear feet and will be paid at the contract unit price per linear foot for the size and type specified. This price shall include posts, clamps and breakaway base assemblies.

Section 700.05—Measurement and Payment is amended to add the following:

Square tube post foundations will be measured in units of each and will be paid for at the contract unit price per each for the type specified. This price shall include anchor sleeve, post sleeve, slip base assembly, soil stabilizing plate, drive tube foundation, concrete, hardware, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring disturbed areas.

VA sign structure foundations will be measured in units of each and will be paid for at the contract unit price per each for the size specified. No payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. When excess concrete is approved by the Engineer, the additional concrete will be paid for in cubic yards for the invoiced material cost only. This price shall include concrete, reinforcing steel, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring disturbed areas.

VIA sign structure foundations will be measured in units of each and will be paid for at the contract unit price per each for the size specified. No payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. When excess concrete is approved by the Engineer, the additional concrete will be paid for in cubic yards for the invoiced material cost only. This price shall include concrete, reinforcing steel, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring disturbed areas.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------------------------|-----------------|
| VA sign post (size) | Linear foot |
| VIA sign post (size) | Linear foot |
| Square tube sign post (size and type) | Linear foot |
| Square tube post foundation (type) | Each |
| VA sign structure foundation (size) | Each |
| VIA sign structure foundation (size) | Each |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES — PROJECTS REQUIRING TRAFFIC SIGNS

SS70103-0815

April 15, 2015

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 701—TRAFFIC SIGNS****SECTION 701—TRAFFIC SIGNS** of the Specifications is amended as follows:**Section 701.03—Procedures** is amended as follows:**Section 701.03(a)2. Sign panels** is replaced with the following:

Panels for permanent signs shall be fabricated of aluminum 0.100 inch in thickness and shall be smooth, flat, and free of metal burrs and splinters. Sign panels for overlays shall be aluminum alloy conforming to the Section 229.02(a), between 0.080 and 0.100 gage in thickness.

Extruded sign panels shall conform to the *VDOT Road and Bridge Standards* and Section 229.02(c).

Section 701.03(a)5. Joining sign base panels is amended to replace the first sentence with the following:

Horizontal joints shall be constructed according to *VDOT Standard Drawing SPD-1*.

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

The Contractor shall install sign panels on overhead sign structures so that the vertical clearance is not less than 19 feet and not more than 21 feet from the bottom of the lowest mounted sign panel to the crown of the roadway, unless otherwise specified on the plans.

Section 701.03(d). Erection is amended to delete the last sentence of the first paragraph.**Section 701.03(d). Erection** is amended to delete the last paragraph.**Section 701.03(d). Erection** is amended to include the following:

Overlay panels shall be installed on a flat portion of the existing sign panel with no protruding bolts or bolt heads. Overlay of overhead sign panels shall be according to details shown on the plans.

Section 701.04 Erection 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 unit price per square foot. This price shall include background sheeting, sign messages, finishing, framing units, hanger assemblies, bracing, stiffeners, splicing, backing strips, post clips/post clamps, warranty and labeling.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES — FOR PROJECTS REQUIRING TRAFFIC SIGNALS. INCLUDE: SS23802 Electronic and Signal Components AND SS70005 General (Traffic Control Devices) FOR CABLE.

SS70301-0609

January 6, 2009

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS

SUPPLEMENTAL SECTION 703—TRAFFIC SIGNALS

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

Section 703.02—Equipment is amended as follows:

Section 703.02(g)—Detectors is amended to delete 1. Magnetic detectors and 2. Magnetic detector amplifiers.

Section 703.03—Procedures is amended as follows:

Section 703.03(e) Installing signal heads is amended to replace the last sentence of the second paragraph with the following:

 Joints shall be rendered weatherproof by an approved method.

Section 703.03(g)1.—Magnetic Detectors is deleted.

Section 703.04—Measurement and Payment is amended as follows:

Section 703.04—Measurement and Payment is amended to delete the sixth paragraph, **Magnetic detector sensing elements** and the fourteenth paragraph, **Cable terminal enclosures**.

Section 703.04—Measurement and Payment is amended to include the following:

Pedestrian actuation will be measured in units of each and will be paid for at the contract unit price per each. This price shall include pedestrian pushbutton, fittings, sign(s), conduit, conduit when required, supplementary grounding electrode, grounding conductor, and concrete foundation when required.

Flashing beacon will be measured in units of each and will be paid for at the contract unit price per each. This price shall include galvanized post, conduit, concrete foundation, grounding electrode, ground conductor, signal heads, breakaway connectors, sign panels and mounting hardware.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------------------|-----------------|
| Pedestrian actuation (Standard) | Each |
| Flashing beacon (Standard) | Each |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

GUIDELINES — FOR PROJECTS REQUIRING PAVEMENT MARKINGS OR MARKERS.

SS70402-0815

April 15, 2015

VIRGINIA DEPARTMENT OF TRANSPORTATION
2007 ROAD AND BRIDGE SUPPLEMENTAL SPECIFICATIONS**SUPPLEMENTAL SECTION 704—PAVEMENT MARKINGS AND MARKERS****SECTION 704—PAVEMENT MARKINGS AND MARKERS** of the Specifications is amended as follows:**Section 704.02—Materials** is amended to include the following:

All pavement markers and pavement marking materials shall be selected from the *VDOT Materials Division Approved Products List*

Section 704.03—Procedures is amended to replace the second sentence of the second paragraph with the following:

Pavement markings installations, including symbol/message markings, shall be completed within the time limits herein on roadways where the pavement markings have been removed or obscured and the roadway is reopened to traffic, unless otherwise directed by the Engineer.

Section 704.03—Procedures is amended to replace the third through fifth paragraphs with the following:

Pavement marking installation on interstates, and other freeways (fully limited-access divided roadways with two or more lanes per direction) with posted speed limit of 55 mph and greater, shall be completed within the workday during which the pavement markings were removed, eradicated, or obscured prior to reopening the lanes to traffic.

Pavement marking installation on non-freeway roads having traffic volumes of 10,000 ADT or more shall be completed within 24 hours after the end of the workday on which the existing pavement markings were removed, eradicated, or obscured.

Pavement marking installation on non-freeway roads having traffic volumes between 3,000 and 10,000 ADT shall be completed within 48 hours after the end of the workday on which the existing pavement markings were removed, eradicated, or obscured.

Pavement marking installation on non-freeway roads having traffic volumes of less than 3,000 ADT shall be completed within 72 hours after the end of the workday on which the existing pavement markings were removed, eradicated, or obscured.

Section 704.03(a) Pavement Markings is amended to replace the seventh through eleventh paragraphs with the following:

Pavement message/symbol markings shall be installed using Type B Class I, II, or IV markings unless indicated otherwise in the contract documents and shall include, but not be limited to school zone markings, railroad crossing markings, accessible (disabled) parking symbols, turn lane (elongated) arrows, word messages, etc.

The Contractor shall protect the public against potential damages that may result from pavement marking operations. The Contractor shall be responsible for the complete preparation of the pavement surface, including, but not limited to, removing dust, dirt, loose particles, oily residues, curing compounds, concrete laitance, residues from eradication, and other foreign matter

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

immediately prior to installing pavement markings. The pavement surface shall be dry when tested in accordance with VTM-94 at the time of permanent pavement marking installation. The Contractor shall be responsible for providing the apparatus indicated in VTM-94 that are needed to perform the moisture test.

Liquid markings shall be applied so as to prevent splattering and overspray, and shall be protected from traffic until track free by the use of traffic control guarding or warning devices as necessary. If a vehicle crosses a pavement marking and tracks it, or if splattering or overspray occurs, the affected marking and resultant tracking, overspray or splattering shall be immediately eradicated, the affected pavement and other surfaces cleaned and prepared, and new markings applied at the Contractor's expense.

Equipment shall be thoroughly cleaned between changes in colors or types of materials.

Pavement markings shall have clean and well-defined edges without running, bleeding or deformation. Markings shall be uniform in appearance, free of waviness; (the edge of the marking not varying more than 1/4 inch in three feet from a straight line or more than one inch in fifty feet for a maximum distance of 500 feet) shall be straight on tangent alignment; and shall be on a true arc on curved alignment.

The widths of pavement markings shall not deviate more than 1/4 inch on tangent sections, nor more than 1/2 inch on curves from the required width. The length of the gap and the length of the individual stripes that form skip lines shall not deviate more than two inches from their required lengths. The length of the gap and individual skip line shall be of such uniformity throughout the entire length of each that a normal striping machine shall be able to repeat the pattern and superimpose additional striping upon the existing marking.

Glass beads shall be applied at the rate specified herein and shall be evenly distributed over the entire surface of the marking. The Contractor shall apply beads to the surface of liquid markings with a bead dispenser attached to the applicator that shall uniformly dispense beads simultaneously on and into the just-applied marking. The bead dispenser shall be equipped with a cut-off control synchronized with the applied marking material cut off control so that the beads are applied totally on the marking. Beads shall be applied while the liquid marking is still fluid. Approximately 70 percent of the beads shall be buried in the marking, and the remaining 30 percent shall be 50 to 60 percent embedded in the marking's surface, unless otherwise specified by the pavement marking manufacturer. Beads installed on crosswalks and stop lines on roadways with curbs only (no gutter) may be hand applied for two feet at the end of each line next to the curb with 100 percent of the beads embedded 50 to 60 percent into the marking's surface.

The Contractor shall provide written certification that all preformed symbols/characters, or the templates used to create such symbols/characters for non-preformed markings, match the size and shape specified in the *VDOT Road And Bridge Standards* and the contract documents.

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

Non-truck mounted equipment for application of thermoplastic material shall be of the screed extrude type with a screw-drive or shall be self-propelled and regulated to allow for calibration of the amount of material applied. Non-truck mounted equipment for application of epoxy resin material shall also be self-propelled and regulated to allow for calibration of the amount of material applied.

Section 704.03(a)2a Thermoplastic (Class I) is replaced with the following:

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Thermoplastic (Class I) material shall be applied by screed extrusion, ribbon gun, or spray equipment. Alkyd thermoplastic may be applied directly after the paving operations; however, hydrocarbon thermoplastic shall not be applied less than 30 days after the paving operations.

Alkyd and hydrocarbon materials shall not be mixed together. The Contractor shall ensure equipment is thoroughly cleaned when colors or types of material are changed.

Thermoplastic shall not be applied over existing pavement markings of other materials unless the existing marking is 90 percent worn away, obscured, or eradicated. Thermoplastic shall only be applied over existing thermoplastic markings if the existing thermoplastic markings are clean and not chalky, chipped or powdery in appearance or condition.

Section 704.03(a)2b Polyester Resin (Class II) is replaced with the following:

Preformed Thermoplastic (Class II) material shall be installed per the manufacturer's recommendations. When markings are installed on hydraulic cement concrete pavement, primer shall be applied first in accordance with manufacturer's requirements.

Additional glass beads shall be applied evenly to the surface of the preformed thermoplastic material for messages and symbols immediately after installation at the rate of 7 pounds per 100 square feet to facilitate embedment while the material is in a softened state using manufacturer approved equipment, bead package, and methods.

Section 704.04—Measurement and Payment is amended to replace paragraphs two and three with the following:

Pavement message markings will be measured in units of each or linear feet and will be paid for at the contract unit price per each per location or linear foot as applicable for the size and/or type and class specified. This price shall include the pavement marking material, surface preparation, quality control tests, daily log, guarding devices, primer/adhesive, and glass beads.

Pavement markers will be measured in units of each for the type specified and will be paid for at the contract unit price per each. This price shall include pavement cutting, surface preparation, primer if required, prismatic retroreflectors, adhesive, and castings.

Payment will be made under:

| Pay Item | Pay Unit |
|---|---------------------|
| Pavement message marking (Symbol or Text, Size, Type and Class) | Each or linear foot |
| (Type)Pavement marker (type pavement) | Each |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

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

Table VII-1 Pavement Markings is replaced with the following:

**TABLE VII-1
Pavement Markings**

| Type | Class | Name | Surface Temp. at Time of Application | Film Thickness (mils) | Pavement Surface | Application Limitations |
|------|-------|---------------------------------------|--------------------------------------|-----------------------|------------------|--|
| A | | Traffic paint | 50°F+ | 15 ± 1 when wet | AC HCC | May be applied directly after paving operations |
| B | I | Thermoplastic Alkyd | 50°F+ | 90 ± 5 when set | AC HCC | May be applied directly after paving operations |
| | I | Thermoplastic Hydrocarbon | 50°F+ | 90 ± 5 when set | AC HCC | Do not apply less than 30 days after paving operations |
| | II | Preformed Thermoplastic | 50°F+ | 120-130 | AC HCC | Manufacturer's recommendations |
| | III | Epoxy resin | 50°F+ | 20 ± 1 when wet | AC HCC | Pavement surface needs to be at least 1 day old |
| | IV | Plastic-backed preformed Tape | (Note 1) | 60 - 90 | AC HCC | Manufacturer's recommendations |
| | VI | Profiled preformed Tape | (Note 1) | (Note 1) | AC HCC | Manufacturer's recommendations |
| | VII | Polyurea | (Note 1) | 20 ± 1 when wet | AC HCC | Manufacturer's recommendations |
| D | II | Removable tape | (Note 1) | (Note 1) | AC HCC | Temporary (Construction) pavement marking |
| E | | Removable Black tape (Non-Reflective) | (Note 1) | (Note 1) | AC | Temporary (Construction) pavement marking for covering existing markings |
| F | I | Temporary paint | (Note 1) | 40 max | AC HCC | Temporary (Construction) pavement marking |

Note 1: In accordance with manufacturer's recommendation.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

———— CNSP SELECT USE 700 SERIES SPCNs and SPs ————

The following are Select Use Special Provisions. None have been through the Department's complete Specifications Committee review/comment/acceptance process and are not part of the Standard Specifications. They are to be considered as project-specific and may be subject to modifications required to meet specific project conditions or requirements for Federal funding. Anyone making modifications is responsible for obtaining the appropriate expertise in the discipline applicable to the modification. If modifications are made the date must also be changed to reflect the current date. Please send a copy of the modified special provision with the new date and specific project number to David.Gayle@VDOT.Virginia.gov so it may be added to the Specifications Stockpile.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

cu703000a Saw Cut (Loop Detectors)

GUIDELINES – ASPHALT PROJECTS WHEN REQUIRED BY THE DESIGNER (USUALLY HAMPTON ROADS DISTRICT).

SAW CUT — Section 703.04—Measurement and Payment of the Specifications is amended to replace the ninth paragraph (**Saw cuts**) with the following:

Saw cut will be measured in linear feet for the width specified and will be paid for at the contract unit price per linear foot. This price shall include cutting, cleaning, drilling, disposing of surplus material, furnishing and installing backer rods, and loop sealant material.

| Pay Item | Pay Unit |
|-----------------|-----------------|
| Saw Cut (Width) | Linear foot |

10-2-08a (SPCN)

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

SU704000B Preform Thermo Pave Marking**GUIDELINES – FOR PROJECTS REQUIRING THE CONTRACTOR TO PROVIDE AND INSTALL PREFORMED THERMOPLASTIC PAVEMENT MARKINGS (INCLUDES ARROWS, STOP BARS, MESSAGES, ETC.).****VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
PREFORMED THERMOPLASTIC PAVEMENT MARKINGS**

November 29, 2011b

I. DESCRIPTION

These specifications provide criteria for furnishing and installing durable, retroreflective preformed thermoplastic material for use in installing pavement markings, message markings and pavement marker applications. Lines, legends and symbol material shall be capable of being affixed (fusing) to asphalt concrete (bituminous) pavements by the use of a heating source.

II. DETAIL REQUIREMENTS

Prefomed thermoplastic marking materials shall be in accordance with the Department's [approved products list](#).

Material shall be a preformed, beaded reflectorized thermoplastic pavement marking material that is applied to the road surface using a heat source such as a propane torch. Upon cooling to normal pavement temperature, the material shall produce a reflectorized message, legend or symbol of specified thickness, width or design capable of resisting deformation to traffic. Material shall not distort because of temperature variations prior to application. The Contractor shall ensure that the pavement surface is clean, dry and free of debris or other deleterious material which may affect performance by removing all dust, dirt, loose particles heavy oil residues and other deleterious materials that may affect proper installation. Manufacturer/Supplier must enclose application instructions (multilingual) in with each box/package of materials.

Material shall be suitable for use on asphalt concrete surfaces and shall be capable of being applied to previously applied pavement marking material of the same composition under normal conditions of use. Marking material must be capable of conforming to pavement contours, breaks and faults through the action of traffic within the range of temperatures as specified herein. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with the heat source. In addition to being capable of fusing itself over existing markings such new markings shall be furnished to match the size dimensions and shape of existing markings.

Material shall not exude fumes that are toxic or injurious to persons, animals or property when heated to the application temperature.

Material shall withstand air and roadway temperature variations from 0 degrees F to 140 degrees F without deforming, bleeding, staining, discoloring and shall maintain their original dimensions and placement without chipping, spalling, or cracking. Material shall not deteriorate because of contact with sodium chloride, calcium chloride, mild alkalies and acids, or other ice control material; oil in the pavement material; or oil and gasoline drippings from vehicles.

Material, except for reversible arrows, shall have factory applied coated surface and intermixed beads. Intermixed beads shall be uniformly distributed throughout the material at a minimum of 30 percent by weight. Reversible arrows shall have intermixed beads only. Surface beads for reversible arrows shall conform to the requirements of Section 234 and be furnished and applied by the installer.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Initial skid resistance value shall be at least 45 BPN when tested in accordance with ASTM E 303.

Retained retroreflectivity, durability and color of markings shall conform to the following requirements after being installed on a northern region test deck for one year.

Retroreflectivity: Photometric quantity to be measured is coefficient of retroreflected luminance (R_L) in accordance with the requirements of ASTM E 1710. R_L shall be expressed in millicandelas per square foot per foot per foot-candle and shall be at least the following values when measured in the wheel path area.

| | Initial | Retained (after 1 Year) |
|--------|---------|-------------------------|
| White | 300 | 90 |
| Yellow | 200 | 70 |

Durability: Material shall have a durability rating of at least 4 when determined in the wheel path area.

Retained Daytime Color: Retained daytime color of markings shall conform to the requirements of ASTM D 6628.

Initial Nighttime Color: Initial nighttime color of preformed thermoplastic plastic pavement marking material shall conform to the following CIE chromaticity coordinate requirements when tested in accordance with VTM 111.

| CIE CHROMATICITY COORDINATE LIMITS (INITIAL WITH DROP-ON BEADS) | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|
| Color | 1 | | 2 | | 3 | | 4 | |
| | x | y | x | y | x | y | x | y |
| Yellow | 0.486 | 0.439 | 0.520 | 0.480 | 0.560 | 0.440 | 0.498 | 0.426 |

Material shall not be formulated with any compounds of the heavy metals listed in 40 CFR 261.24 Table 1 except that barium sulfate is allowed. Total heavy metal levels, with the exception of barium sulfate, shall not exceed 20 times the specified regulatory limits.

Amount and type of yellow pigment and inert filler for yellow material shall be at the option of the manufacturer provided the material complies with all other requirements of this specification.

Material to be supplied may be of either of the following types:

- Type where the manufacturer requires preheating of the roadway surface to a specified temperature prior to installation of the preformed thermoplastic material.
- Type where the manufacturer requires preheating of the roadway surface prior to installation of the preformed thermoplastic material to only remove moisture when necessary.

Current manufacturer installation instructions will be used to determine which type material a manufacturer produces. A copy of the instructions shall be provided to the Engineer.

When installing over existing thermoplastic markings new preformed thermoplastic pavement markings shall conform to the shape and completely adhere (fuse) to the old existing markings. Materials on this list determined not to conform to these requirements based on this verification testing will not be acceptable.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

Materials failing any of the requirements of this provision will be deemed unacceptable and the Contractor shall then furnish acceptable materials meeting these requirements at no additional cost to the contract.

III. DESIGN APPLICATIONS

Crosswalks and stop lines shall be installed using preformed thermoplastic pavement markings conforming to the details and dimensions of the contract. Crosswalk lines shall be one foot wide and stop lines shall be two feet in width.

Pavement message markings and symbols shall be installed using preformed thermoplastic pavement markings conforming to the designs and dimensions detailed in the contract.

IV. MEASUREMENT AND PAYMENT

Preformed thermoplastic pavement marking will be measured in linear feet or each depending on the configuration of the message marking (linear, message or symbol) as designated in the contract and will be paid for at the contract unit price per linear foot or each as specified by the individual message marking. This price shall include furnishing pavement marking material, message or symbol, surface preparation, primer-sealer, additional surface glass beads, installation, daily log (Form C-85), guarding devices, or other incidentals recommended for installation by the manufacturer.

Payment will be made under:

| Pay Item | Pay Unit |
|---------------------------------|---------------------|
| Preformed (width) Thermoplastic | Linear foot or Each |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

SU704001A Pavement Dotting**GUIDELINES – FOR PROJECTS WHERE THE FINAL PAVEMENT MARKINGS WILL BE INSTALLED BY THE DEPARTMENT OR BY OTHER CONTRACTS.**

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
PAVEMENT DOTTING

October 8, 2008a

I. DESCRIPTION

This work shall consist of the furnishing and placing of pavement dots to establish the location of pavement markings on the roadway in accordance with 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 in accordance with Section 704.03 of the Specifications.

II. MATERIALS

Pavement dots shall be removable tape (Type D, Class I or II) conforming to the requirements of Section 246.02(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 in accordance with 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 |

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.

