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:


TABLE OF CONTENTS

——— STANDARD 700 SERIES SPCNs, SPs and SSs ———— .................................................................7-1

(c700i00) SECTION 700—GENERAL (Anchor Bolts) 2-21-13 (SPCN) ...........................................7-2

c704bm0 COVER CLEAN & INSPECT EXIST. RAISED PAVE. MARKERS 8-29-08 (SPCN) ..........7-5

c704cm0 SWEEPING PRIOR TO PAVEMENT MARKING 9-18-01a (SPCN) ...............................7-5

S704E02 - TYPE B, CLASS VI PAVEMENT LINE MARKING TAPE 10-21-11 .................................7-6

S704GM2 - REPLACE PAVE. LINE MARK., PAVE. MARKERS & LOOP DETECT. 9-27-11 .........7-11

S704M05 - SEC. 704—PAVEMENT MARKINGS AND MARKERS 9-12-14 .................................7-12

S704N00 - TYPE B, CLASS VII POLYUREA PAVEMENT MARKINGS 10-17-11 ..........................7-22

SS70004 - SUPP. SEC. 700—GENERAL 2-21-13 .................................................................7-25

SS70102 - SUPP. SECTION 701—TRAFFIC SIGNS 1-22-09c .........................................................7-32

SS70301 - SUPP. SECTION 703—TRAFFIC SIGNALS 1-6-09 .......................................................7-33

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
SS70401 - SUPP. SEC. 704—PAVEMENT MARKINGS & MARKERS 10-14-11..........................7-34
——— CNSP SELECT USE 700 SERIES SPCNs and SPs ————..............................................7-35
SAW CUT 10-2-08a (SPCN) ..............................................................................................................7-36
PREFORMED THERMOPLASTIC PAVEMENT MARKINGS 11-29-11b........................................7-37
PAVEMENT DOTTING 10-8-08a ...........................................................................................................7-40

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
STANDARD 700 SERIES SPCNs, SPs and SSs

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
GUIDELINES — PROJECTS REQUIRING SIGNS, SIGNALS, LIGHTING OR NAVIGATIONAL LIGHTS.

(c700i00-0313) SECTION 700—GENERAL of the Specifications is amended as follows:

Section 700.04—Procedures is amended to include the following:

(k) Anchor Bolts

Traffic control device foundations shall have a bolt template positioned for correct orientation of the structure with respect to the structure location and roadway alignment and to maintain the anchor bolts vertical (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 ¼" 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 for 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 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 any nut could not be brought into 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.

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

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
of the anchor bolt plus one inch. Place structural hardened washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the first top nuts onto the anchor bolts.

7. Tighten first top nuts to a snug-tight condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12-inch long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.

8. Tighten bottom leveling nuts to a snug-tight condition in a star pattern.

9. At this point, verify again if beveled washers are necessary using the 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 until achieving. 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>
<thead>
<tr>
<th>Anchor Bolt Diameter, (in.)</th>
<th>Nut Rotation beyond Snug - Tight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASTM F 1554 Grade 36 (M314)</td>
</tr>
<tr>
<td>≤1½</td>
<td>1/6 turn (60°)</td>
</tr>
<tr>
<td>&gt;1½</td>
<td>1/12 turn (30°)</td>
</tr>
</tbody>
</table>

Nut rotation is relative to anchor bolt. Anchor bolt nut tensioning shall not exceed plus 20°.

*Unified Thread Standard (UNC) tensioning is applicable.*

Lock nuts and/or split washers shall not be allowed with anchor bolts.

11. Anchor bolt connections that have been tightened shall be inspected in the presence of the Engineer by a calibrated torque wrench. The torque wrench shall be used to verify that a torque at least equal to the verification torque as provided in Table 2 is achieved. A minimum of every other bolt shall be inspected.

<table>
<thead>
<tr>
<th>Table 2</th>
</tr>
</thead>
</table>

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
<table>
<thead>
<tr>
<th>Anchor Bolt Diameter, (in.)</th>
<th>Verification Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>ASTM F 1554</strong> Grade 36 (M314) Tension/Torque kips/ft-lbs.</td>
</tr>
<tr>
<td></td>
<td>kips</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
</tr>
<tr>
<td>1 1/4</td>
<td>28</td>
</tr>
<tr>
<td>1 1/2</td>
<td>41</td>
</tr>
<tr>
<td>1 3/4</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>73</td>
</tr>
<tr>
<td>2 1/4</td>
<td>94</td>
</tr>
<tr>
<td>2 1/2</td>
<td>116</td>
</tr>
<tr>
<td>2 3/4</td>
<td>143</td>
</tr>
<tr>
<td>3</td>
<td>173</td>
</tr>
<tr>
<td>3 1/4</td>
<td>206</td>
</tr>
<tr>
<td>3 1/2</td>
<td>242</td>
</tr>
<tr>
<td>3 3/4</td>
<td>280</td>
</tr>
<tr>
<td>4</td>
<td>321</td>
</tr>
</tbody>
</table>

12. Install second top nut on each bolt to snug tight.

13. 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 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 report and reported to the Project Engineer and VDOT Materials Division.

Section 700.05—Measurement and Payment for Concrete foundations is replaced with the following:

**Concrete foundations** will be measured and paid for in units of each or cubic yards of concrete as applicable. When paid for in cubic yards of concrete, no payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. This price shall include foundation design, concrete, reinforcing steel, stub poles, anchor bolts, bolt circle templates, lubricant, torque, UT testing, grounding equipment, conduits, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

2-21-13 (SPCN)

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
GUIDELINES – ASPHALT MAINTENANCE PROJECTS (SLURRY SEAL AND LATEX ONLY). NOT NEEDED WHEN VOLUME 2 SLURRY/LATEX IS USED.

(c704bm0-1109) COVERING CLEANING AND INSPECTING EXISTING RAISED PAVEMENT MARKERS - The Contractor shall cover all existing raised pavement markers by an approved method and material to protect and ensure the integrity of the markers prior to resurfacing. After completion of the resurfacing operation the covering shall be removed, the raised markers cleaned and inspected to insure they are fully operational. Any raised markers damaged by the Contractor’s operations shall be replaced by the Contractor at no expense to the Department. The covering, cleaning, and inspection of the raised markers will not be measured for payment and all cost for performing this work shall be included in the price bid for other items of work.

8-29-08 (SPCN)

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

(c704cm0-1109) 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 pavement markings. Pavement markings shall be installed within 14 days after completion of surface treatment. The cost of sweeping the roadway prior to installing pavement marking shall be included in the price bid for pavement marking.

9-18-01a (SPCN)

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
GUIDELINES — FOR PROJECTS REQUIRING TYPE B, CLASS VI PAVEMENT LINE MARKING. INCLUDE:
SS70401 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.

2007
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 Millicandels per square foot per footcandle \([\text{mcd} \cdot \text{ft}^{-2} \cdot \text{fc}^{-1}]\).

<table>
<thead>
<tr>
<th>Color</th>
<th>New</th>
<th>1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>500</td>
<td>300</td>
</tr>
<tr>
<td>Yellow</td>
<td>300</td>
<td>200</td>
</tr>
</tbody>
</table>

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 ($R_e$) of 100 milli-candels per square foot per foot-candle $[(\text{mcd} \cdot \text{ft}^{-2}) \cdot \text{fc}^{-1}]$ when measured in accordance with the requirements of ASTM E 1710 for the following duration:

<table>
<thead>
<tr>
<th>Longitudinal Marking Tape Retroreflective Warranty Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Asphalt Concrete Pavement (Inlay)</td>
</tr>
<tr>
<td>Existing Asphalt Concrete Pavement (Overlay)</td>
</tr>
<tr>
<td>Portland Cement Concrete (PCC) Surfaces</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Longitudinal Marking Tape Color Warranty Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Asphalt Concrete Pavement (Inlay)</td>
</tr>
<tr>
<td>Existing Asphalt Concrete Pavement (Overlay)</td>
</tr>
<tr>
<td>Portland Cement Concrete (PCC) Pavement Surfaces</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type B, Class VI pavement line marking (Width)</td>
<td>Linear foot</td>
</tr>
<tr>
<td>Type B, Class VI contrast pavement line marking (Width)</td>
<td>Linear foot</td>
</tr>
</tbody>
</table>

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

Section 704.02—Materials is amended to add the following:

(d) **Flexible temporary pavement markers (FTPMs)** are pavement markings that the Contractor may choose to substitute for Type D or Type F pavement markings. FTPMs may be used on surface treatment, slurry seal, latex emulsion treatment, and plant mix. FTPMs may be used to simulate skip-line and solid-line centerline markings and to simulate skip-line and solid-line lane-division markings (in accordance with the details furnished herein) installed on the newly-placed roadways once the surface has cured. **Please note:** Temporary edge-line markings will not be required.

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

**Flexible temporary pavement markers (FTPMs)** shall consist of products from the Department’s current Approved List found in the Materials Division’s *Manual of Instructions* (See Flexible temporary pavement marker (FTPM) or web site [http://www.virginiadot.org/business/materials-download-docs.asp](http://www.virginiadot.org/business/materials-download-docs.asp)). All FTPMs shall be new product. FTPMs are suitable for use one year after the date of receipt when stored in accordance with the manufacturer’s recommendations.

Section 704.03—Procedures is amended to replace the first 6 paragraphs:

**PAVEMENT MARKING AND FLEXIBLE TEMPORARY PAVEMENT MARKER (FTPM) OPERATIONS**

The Contractor shall have a Pavement Marking Technician, certified in accordance with the Department’s Materials Certification Program for Pavement Marking, present during all pavement marking and marker operations except FTPM operations. When the Contractor chooses to substitute FTPMs for temporary pavement markings, a certified Pavement Marking Technician will not be required for the FTPM operation.

- **Temporary pavement markings:** The type, class, installation procedures and time limits of temporary pavement markings shall be in accordance with the provisions specified herein and Section 704 of the Specifications.

Temporary pavement markings, including skip lines and solid lines, shall be installed at the same locations that permanent pavement markings shall be installed.

Once temporary pavement marking operations have begun, all skip-line and solid-line centerline markings, and skip-line and solid-line lane-division markings shall be completed.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
before the marking operation is stopped. The installation of temporary edge-line markings will not be required unless otherwise specified in the notes section of the schedule of routes, within the contract documents.

Installation and refreshing of (as authorized by the Engineer, if necessary) temporary pavement markings shall not affect the 30 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation.

- **Flexible temporary pavement markers (FTPMs):** The type, installation procedures and time limits for the use of FTPMs shall be in accordance with the manufacturer's recommendations, the provisions specified herein and Section 704 of the Specifications.

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 drawings designated as "TYPICAL PLAN FOR FTPM PLACEMENT" included herein.

FTPMs shall include skip-line and solid-line centerline markings, and skip-line and solid-line lane-division line markings installed on the newly-placed surfaces, once the surface has cured or on milled surfaces within the time limits for unmarked pavement for the respective volumes of vehicles herein.

The pavement surface shall be free of dirt, dust, debris, moisture, oil, and any residue that may be detrimental to successful application. If such is present, the Contractor shall prepare the pavement surface by air blowing or a thorough brushing. FTPMs used to simulate skip lines and solid lines shall be installed at the same locations that permanent pavement markings shall be installed.

Once FTPM operations have begun, all skip-line and solid-line centerline markings, and skip-line and solid-line lane-division markings shall be completed before the operation is stopped. Temporary edge-line markings will not be required.

FTPMs shall be removed and properly disposed of when permanent pavement markings are accomplished as required in accordance with the time limits specified herein. Used FTPMs removed from the pavement when no longer needed or permitted, including all containers, packaging, damaged FTPMs and all other miscellaneous items of waste shall be appropriately disposed of in a properly permitted waste container in accordance with applicable local, state and federal laws and regulations.

Replacement of FTPMs, required to maintain temporary markings, shall not affect the 30 calendar-day time limitation between pavement placement and completion of permanent pavement marking installation.

For surface treatment, slurry seal or latex emulsion treatment operations, the appropriate FTPMs shall be installed prior to placing new pavement or treatment. Upon completion of surface treatment, slurry seal or latex emulsion treatment placement, the Contractor shall remove the protective covering from the reflective lens of the FTPM prior to leaving the work site. Failure to remove such covering may 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, has cooled to the FTPMs manufacturer’s recommended temperature for installation, and the surface has cured.
- **Permanent Pavement Markings:** The type, class, installation procedures and time limits of permanent pavement markings shall be in accordance with the provisions specified herein and Section 704 of the Specifications.

For newly-placed asphalt surfaces (including plant mix, surface treatment, latex slurry, etc), permanent pavement marking, temporary pavement marking or FTPM installation shall be completed in accordance with the time limits specified below unless otherwise directed by the Engineer. Exceptions to the below time limits will be granted only for weather restrictions and for installation of Type B, Class VI and epoxy resin or polyurea pavement markings, on plant mix roadways. Installation of Type B, Class VI, pavement markings on plant mix roadways are not applicable to these requirements if they are inlaid with the last pass of the asphalt roller or directly after the asphalt roller using a separate roller. Installation of epoxy resin or polyurea pavement markings on newly placed plant mix pavement shall not commence until after 24 hours of final surface placement.

**PERMANENT AND TEMPORARY PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMs)**

- **Permanent pavement markings** are durable pavement markings that, when installed, provide final traffic guidance after all operations related to the project are complete in accordance with the provisions herein, Section 704 of the Specifications and as specified elsewhere in the Contract.

Permanent pavement markings shall include skip-line and solid-line centerline markings, skip-line and solid-line lane-division markings and, solid-line edge-line markings installed on the newly-placed roadways once the surface has cured.

- **Temporary pavement markings** are pavement markings that, when installed, provide limited-duration traffic guidance until permanent pavement markings are installed in accordance with Section 704 of the Specifications, as specified elsewhere in the Contract, and as follows:

  The VTM-94 moisture test is optional 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 result on the C-85.

  If the surface is visibly dry and 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 VDOT for 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 VDOT will pay for one subsequent reapplication of the temporary markings once the surface has dried if the previous installation did not satisfactorily adhere to the road.

  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.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
Temporary pavement markings applied to planed (milled) surfaces or other non-final surfaces shall consist of an application of Type F, temporary traffic paint 15 mils thick, representing 100 percent of the final pavement marking width and length with 6 pounds of glass beads per gallon of material.

Type F for final paved surfaces shall be modified. Such modification shall consist of the application of Type F, temporary traffic paint, 8 to 10 mils thick representing 75 percent of the final pavement marking width and with 3 pounds of glass beads per gallon of material. Skip lines shall be applied in 8-foot lengths and approximately 32 foot gaps. Temporary Type F, pavement markings shall be arranged and spaced on their installation so as to be completely covered by the application of permanent pavement markings. Failure to place Type F, temporary markings at the application rate and spacing specified herein may result in the non-payment for such markings. No eradication of such modified Type F, temporary markings will be required when the Contractor installs such temporary pavement markings as detailed herein and such markings have been in place for no less than 3 days prior to the application of permanent pavement markings.

Temporary pavement markings for plant mix shall also include:

- Type D pavement markings in accordance with the requirements of Section 704 of the Specifications.

Premarking (or layout marking) is NOT acceptable for use as a temporary pavement marking.

MAINTENANCE OF TEMPORARY PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMs)

Maintenance of Temporary pavement markings applied to paved surfaces shall be in accordance with the following requirements:

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. If temporary pavement markings meet these requirements, no additional application (refreshing) is required. If temporary pavement markings are Type F and these markings do not meet these requirements prior to the time limit for the application 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 marking at the Contractor’s expense when required by the Engineer. Under such circumstances no payment for the eradication of temporary pavement markings will be permitted if required before the application of permanent markings. If other types of permitted temporary pavement markings are used and these fail the visual evaluation or in any other respect are deficient prior to the time for the installation of permanent markings, these types shall be reapplied at the Contractor’s expense when required by the Engineer. These requirements will apply until permanent pavement markings are installed in accordance with the time restrictions herein.

FTPMs shall be installed and maintained in accordance with the manufacturer’s recommendations and the following requirements:

The Contractor shall maintain FTPMs for the time period specified herein or until permanent pavement markings are installed in accordance with Section 704 of the Specifications. Damaged or missing FTPMs shall be replaced with new FTPMs of the same manufacturing type, color and model. No more than one FTPM may be damaged.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
or missing out of every broken 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.

The acceptable ambient air temperature, ambient moisture condition and pavement surface condition prior to the installation of the appropriate FTPMs shall be in accordance with the manufacturer’s recommendations, a copy of which shall be provided to the Engineer prior to installation.

Once applied, FTPMs will be considered for a single use. If a FTPM is lost before permanent markings are installed, it shall be replaced with a new FTPM. FTPMs may remain in place, undamaged, after installation for up to 30 consecutive days. When FTPMs are applied prior to pavement placement, such as with surface treatment, slurry seal and latex emulsion treatment, this 30 consecutive-day time limit shall begin at the time of actual installation of the FTPMs, not at the time of pavement placement completion. In no case shall any installed FTPMs be permitted to remain once time limits require permanent pavement marking installation.

**FTPMs used for surface treatment, slurry seal or latex emulsion treatment operations** shall include a removable material covering the reflective lens to protect the lens from being obscured or damaged by the paving operation.

**PERMANENT PAVEMENT MARKINGS, TEMPORARY PAVEMENT MARKINGS AND FLEXIBLE TEMPORARY PAVEMENT MARKERS (FTPMs) INSTALLATION TIME LIMITS ON ROADWAYS OPEN TO TRAFFIC:**

**Surface Treatment Operations**

The Contractor shall maintain temporary pavement markings until the permanent pavement markings are installed. The Contractor shall sweep surface treated roadways prior to installation of permanent pavement markings as directed by the Engineer but no earlier than 7 days after completion of surface treatment placement. Permanent pavement marking installation shall be completed after sweeping but within 30 calendar days after the end of the workday when the surface treatment pavement surface to be marked was placed.

The following governs the installation time limits for temporary markings or FTPMs:

- **Non-interstate roads having traffic volumes of 10,000 ADT or more:** Temporary pavement markings shall be installed within 24 hours after the end of the workday the new surface treatment is placed and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of surface treatment.

- **Roads having traffic volumes between 3,000 and 10,000 ADT:** Temporary pavement markings shall be installed within 48 hours after the end of the workday the new surface treatment is placed and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of surface treatment.

- **Roads having traffic volumes of 3,000 ADT or less:** Temporary pavement markings or FTPMs will not be required unless determined and authorized by the Engineer to be necessary to ensure the safety of the traveling public. If the Engineer requires FTPMs, such markers shall be installed prior to placement of surface treatment.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
**Slurry Seal or Latex Emulsion Treatment Operations**

Permanent pavement marking installation shall be completed within 30 calendar days after the end of the workday when the slurry seal or latex emulsion treatment pavement surface to be marked was placed.

The following governs the installation time limits for temporary markings or FTPMs. The Contractor shall maintain temporary pavement markings until the permanent pavement markings are installed:

- **Interstate roads**: Temporary pavement markings shall be installed prior to opening to traffic, and maintained by the Contractor until the permanent markings are installed.

- **Non-interstate roads having traffic volumes of 10,000 ADT or more**: Temporary pavement markings shall be installed within 24 hours after the end of the workday the new slurry seal or latex emulsion is placed and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment.

- **Roads having traffic volumes between 3,000 and 10,000 ADT**: Temporary pavement markings shall be installed within 48 hours after the end of the workday the new slurry seal or latex emulsion is placed and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment.

- **Roads having traffic volumes of 3,000 ADT or less**: Temporary pavement markings shall be installed within 72 hours after the end of the workday the new slurry seal or latex emulsion is placed and maintained until the permanent pavement markings are installed. If FTPMs are used they shall be installed prior to placement of slurry seal or latex emulsion treatment.

**Plant Mix Operations**

Prior to the end of the workday the Contractor shall determine whether permanent pavement markings can be installed within 24 hours after the end of the workday. If the Contractor determines that permanent pavement markings can be installed within such time limits, the permanent pavement markings shall be installed. If the Contractor determines that permanent pavement markings cannot be installed within such time limits he shall install and maintain temporary pavement markings or FTPMs until the permanent pavement markings are installed. **Permanent pavement marking installation shall be completed within 30 calendar days after the end of the workday when the plant mix pavement surface to be marked was placed, unless otherwise noted below.**

- **Interstate roads**: Temporary pavement markings shall be installed prior to opening to traffic, and maintained by the Contractor until the permanent markings are installed.

- **Non-interstate roads having traffic volumes of 10,000 ADT or more**: Permanent pavement markings, temporary pavement markings or FTPMs shall be installed within 24 hours after the end of the workday the plant mix is placed.
- **Rocks having traffic volumes between 3,000 and 10,000 ADT:** Permanent pavement markings, temporary pavement markings or FTPMs shall be installed within 48 hours after the end of the workday the plant mix is placed.

- **Roads having traffic volumes of 3,000 ADT or less:** Permanent pavement markings, temporary pavement markings or FTPMs shall be installed within 72 hours after the end of the workday the plant mix is placed.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
**TABLE VII-1 PAVEMENT MARKINGS** is replaced with the following:

**TABLE VII-1**

*Pavement Markings*

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

**Note 1:** In accordance with manufacturer’s recommendation.

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

2007

7-19
Section 704.04—Measurement and Payment is amended to add the following:

**Permanent pavement markings** will be measured and paid for as the appropriate pavement line marking or pavement message marking pay items and pay units specified in the Contract. For roadways that are surface treated, the cost of sweeping the roadway prior to installing permanent pavement markings shall be included in the price bid for such pavement line or message marking items.

**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 and installing 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 and installing and maintaining the FTPMs, removable covers, surface preparation, quality control tests, daily log, guarding devices, FTPM 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 for the appropriate pay items and pay units specified in the Contract. This price shall include the pavement marking material, surface preparation, quality control tests, daily log, guarding devices, primer/adhesive, glass beads, when required reflective optics materials, and warranty.

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 non-dry surface at the direction of the Engineer as specified herein.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary pavement line markings (type and/or class and width)</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Temporary pavement message markings (Message/symbol), type and/or class</td>
<td>Each of Linear Foot</td>
</tr>
</tbody>
</table>

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
TYPICAL PLAN FOR FTPM PLACEMENT

TRAVEL LANE - TWO-WAY TPM

TRAVEL LANE - TWO-WAY FTPM

SIMULATING A SOLID CENTER LINE - NO PASSING ZONE
PLAN 1

TRAVEL LANE

SIMULATING A BROKEN LINE (40' CYCLE)
TWO LANE ROADWAY - TWO-WAY FTPM
MULTI LANE ROADWAY - ONE-WAY FTPM
PLAN 2

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
GUIDELINES — FOR PROJECTS REQUIRING TYPE B, CLASS VII POLYUREA PAVEMENT LINE MARKING.
INCLUDE: SS70401 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 millicandels per square foot per foot-candle ($\text{mcd} \cdot \text{ft}^{-2} \cdot \text{fc}^{-1}$).

   ![Coefficient of Retroreflected Luminance ($R_L$)]

   - **Color**
     - White: 400
     - Yellow: 300

   *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 D 711.

III. **INSTALLATION:**

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

---

7-23
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:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type B, Class VII Polyurea pavement line marking</td>
<td>Linear foot</td>
</tr>
</tbody>
</table>
GUIDELINES — PROJECTS REQUIRING SIGNS, SIGNALS, LIGHTING OR NAVIGATIONAL LIGHTS.

SS70004-1013

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(i) the first sentence is replaced with the following:

Poles, posts, and overhead sign structures shall conform to the following:

Section 700.02(i)2. is replaced with the following:

2. Overhead sign structures, signal poles (mast arm and strain), and high-mast lighting poles shall be steel.

Section 700.02(i)4. Poles, posts, and overhead sign structures is replaced with the following:

4. Sign posts shall be wood or steel. Square tube post shall be hot-rolled, carbon sheet steel, structural steel quality, conforming to the requirements of ASTM A 1011, Grade 50 except the yield strength after cold-forming shall be 60,000 psi minimum. Steel mounting brackets shall conform to the requirements of ASTM A36. Posts (inside and outside) shall be galvanized in accordance with the requirements of ASTM A653, Coating Designation G-90.

Section 700.02(i) the first and second paragraph is replaced with the following:

Lighting, signal, pedestal poles; sign posts; and overhead sign structures not designed to support variable message signs shall conform to the requirements of the 1994 Edition of AASHTO’s Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

Overhead sign structures, including “butterfly” structures, designed to support variable message signs shall conform to the requirements of the 2001 Edition of AASHTO’s Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and the following clarifications:

- Basic wind speed shall be used in the designs. The alternate method for wind pressures provided in Appendix C shall not be used.

- When the installation location of the structures lies between isotachs, the basic wind speed shall be determined by using the higher adjacent isotach.

- Any optional design parameters indicated in the AASHTO specification that are “allowed when acceptable to the owner” shall not be used for the designs.

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

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
• 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:** Primary grounding electrodes shall be tested 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 Regional Traffic Engineering Office. The completed form shall be signed and submitted to the Engineer after installation of the electrical service grounding.

**Section 700.04(e) Poles, Posts, and Sign Structures** is amended to include the following:

Square tube sign post shall have 7/16-inch (+/- 1/64-inch) openings or knockouts spaced 1-inch on centers on all four sides. When specified on the plans a 2 3/16-inch inner-post shall be used with the 2 ½-inch post for additional strength. The inner-post shall be no less than 6 feet long.

Where posts are to be mounted on a retaining wall or barrier, the Contractor shall provide a mounting bracket, fabricated from steel conforming to the requirements of ASTM A36 and hot dipped galvanized in accordance with ASTM A123. Mounting bracket shall be designed so no connection to the barrier is made on the traffic side of the barrier and shall be secured to the barrier and wall using stainless steel chemically adhesive anchors.

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

Color-coding shall be as follows:

<table>
<thead>
<tr>
<th>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</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit Designation</td>
</tr>
<tr>
<td>Phase A or Line A</td>
</tr>
<tr>
<td>Phase B or Line B</td>
</tr>
<tr>
<td>Phase C</td>
</tr>
<tr>
<td>Grounded Conductor (Neutral)</td>
</tr>
<tr>
<td>Equipment Grounding Conductor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3-phase, 4-wire wye circuits, 480/277 Volts; 3-phase, 3-wire delta circuits, 480 volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit Designation</td>
</tr>
<tr>
<td>Phase A</td>
</tr>
<tr>
<td>Phase B</td>
</tr>
<tr>
<td>Phase C</td>
</tr>
</tbody>
</table>

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

When a conduit enters a box, fitting, or other enclosure, a bushing shall be provided to protect the conductor cable from abrasion unless the design of the box, fitting, or enclosure is such 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:

When conduit is to be installed under an existing roadway, entrance, or fixed object and open cutting is not permitted, conduit shall be installed by an approved directional boring method. Conduit for the directional boring method shall be PVC designed specifically for the directional boring operation or high-density PE. When the plans show more than one conduit at a location to be installed by directional boring, with the Engineers 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 ROATED 360°

<table>
<thead>
<tr>
<th>NOMINAL INSIDE PIPE DIAMETER</th>
<th>BIT (REAMER) DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCHES</td>
<td>INCHES</td>
</tr>
<tr>
<td>1 - 2&quot;</td>
<td>4&quot; BORE HOLE</td>
</tr>
<tr>
<td>2 - 2&quot;</td>
<td>5&quot; BORE HOLE</td>
</tr>
<tr>
<td>3 - 2&quot;</td>
<td>8&quot; BORE HOLE</td>
</tr>
<tr>
<td>1 - 3&quot;</td>
<td>5&quot; BORE HOLE</td>
</tr>
<tr>
<td>2 - 3&quot;</td>
<td>6 ½&quot; BORE HOLE</td>
</tr>
<tr>
<td>3 - 3&quot;</td>
<td>8&quot; BORE HOLE</td>
</tr>
<tr>
<td>1 - 4&quot;</td>
<td>6 ½&quot; BORE HOLE</td>
</tr>
</tbody>
</table>

The Contractor shall use an 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. Do 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 hole (tunnel), it shall be backfilled with a flowable fill immediately, 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:

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
The junction box site shall be excavated such that the depth of the excavation shall be the height of the junction box plus at least twelve inches to allow for bedding aggregate material and such that the width shall be six to eight inches wider than the junction box.

Bedding material shall be No. 68, No. 78, or No. 8 aggregate or Crushed Glass conforming to No. 78, or No. 8 gradation requirements. Aggregate shall be a minimum of twelve inches in depth and entirely cover the bottom of the junction box excavation. The bedding aggregate shall be leveled and tamped prior to installing the junction box.

Junction box 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 as required by the manufacturer. Bracing shall be installed to facilitate removal once backfilling and compaction have been completed. The Contractor shall remove internal bracing after the backfilling and compacting operation has 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 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 shall be at least ninety percent of the theoretical maximum density as defined in Section 101.02 of the Specifications. A mechanical tamping device shall be used to compact the backfill 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 has been completed. The area around the junction box shall be graded and restored as stated in the Specifications.

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

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

Section 700.04—Procedures is amended to include the following:

(k) **Anchor Bolts**

Traffic control device foundations shall have a bolt template positioned for correct orientation of the structure with respect to the structure location and roadway alignment and to maintain the anchor bolts vertical (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 $\frac{1}{4}$" 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 for proper tensioning before the structure is installed.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
Double-nut connections installation procedure: (A minimum of three nuts and two hardened washers shall be provided for each anchor bolt.)

1. If 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 any nut could not be brought into 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.

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 inch. Place structural hardened washers on top of the base plate (one washer corresponding to each anchor bolt), and turn the first top nuts onto the anchor bolts.

7. Tighten first top nuts to a snug-tight condition in a star pattern. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person using a 12-inch long wrench or equivalent. A star tightening pattern is one in which the nuts on opposite or near-opposite sides of the bolt circle are successively tightened in a pattern resembling a star.

8. Tighten bottom leveling nuts to a snug-tight condition in a star pattern.

9. At this point, verify again if beveled washers are necessary using the 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 until achieving. 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>
<thead>
<tr>
<th>Anchor Bolt Diameter, (in.)</th>
<th>Nut Rotation beyond Snug - Tight</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F 1554 Grade 36 (M314)</td>
<td>ASTM F 1554 Grade 55 (M314)</td>
</tr>
</tbody>
</table>

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
Nut rotation is relative to anchor bolt. Anchor bolt nut tensioning shall not exceed plus 20°.

*Unified Thread Standard* (UNC) tensioning is applicable.

Lock nuts and/or split washers shall not be allowed with anchor bolts.

11. Anchor bolt connections that have been tightened shall be inspected in the presence of the Engineer by a calibrated torque wrench. The torque wrench shall be used to verify that a torque at least equal to the verification torque as provided in Table 2 is achieved. A minimum of every other bolt shall be inspected.

**Table 2**

<table>
<thead>
<tr>
<th>Anchor Bolt Diameter, (in.)</th>
<th>Verification Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ASTM F 1554 Grade 36 (M314) Tension/Torque kips/ft-lbs.</td>
</tr>
<tr>
<td>1</td>
<td>18 / 180</td>
</tr>
<tr>
<td>1 1/4</td>
<td>28 / 350</td>
</tr>
<tr>
<td>1 1/2</td>
<td>41 / 615</td>
</tr>
<tr>
<td>1 3/4</td>
<td>55 / 962</td>
</tr>
<tr>
<td>2</td>
<td>73 / 1,460</td>
</tr>
<tr>
<td>2 1/4</td>
<td>94 / 2,115</td>
</tr>
<tr>
<td>2 1/2</td>
<td>116 / 2,900</td>
</tr>
<tr>
<td>2 3/4</td>
<td>143 / 3,932</td>
</tr>
<tr>
<td>3</td>
<td>173 / 5,190</td>
</tr>
<tr>
<td>3 1/4</td>
<td>206 / 6,695</td>
</tr>
<tr>
<td>3 1/2</td>
<td>242 / 8,470</td>
</tr>
<tr>
<td>3 3/4</td>
<td>280 / 10,500</td>
</tr>
<tr>
<td>4</td>
<td>321 / 12,840</td>
</tr>
</tbody>
</table>

12. Install second top nut on each bolt to snug tight.

13. 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 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 report and reported to the Project Engineer and VDOT Materials Division.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
Section 700.05—Measurement and Payment for Concrete foundations is replaced with the following:

Concrete foundations will be measured and paid for in units of each or cubic yards of concrete as applicable. When paid for in cubic yards of concrete, no payment will be made for concrete in excess of the cubic yards of concrete required by the foundation design unless otherwise approved by the Engineer. This price shall include foundation design, concrete, reinforcing steel, stub poles, anchor bolts, bolt circle templates, lubricant, torque, UT testing, grounding equipment, conduits, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring existing areas.

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 existing areas.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.*
GUIDELINES — PROJECTS REQUIRING TRAFFIC SIGNS.

SS70102-0410

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 amended to include the following:

Extruded sign panels shall be in accordance with the drawings and Section 229.02(c) of the Specifications.

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

Vertical clearance for overhead sign structures shall be no less than 19 feet 0 inch and no more than 21 feet 0 inch 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 preformed on a flat surface with no protruding bolts or bolt heads on the existing sign panel.

Overlay of overhead sign panels shall be in accordance with the plan details.

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
GUIDELINES — FOR PROJECTS REQUIRING TRAFFIC SIGNALS. INCLUDE: SS23802 Electronic and Signal Components AND SS70004 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:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian actuation (Standard)</td>
<td>Each</td>
</tr>
<tr>
<td>Flashing beacon (Standard)</td>
<td>Each</td>
</tr>
</tbody>
</table>

*These SPECIFICATIONS REVISIONS are subject to change on short notice.
GUIDELINES — FOR PROJECTS REQUIRING PAVEMENT MARKINGS OR MARKERS.

SS70401-1211

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:

TABLE VII-1 PAVEMENT MARKINGS is replaced with the following:

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

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.
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.

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saw Cut (Width)</td>
<td>Linear foot</td>
</tr>
</tbody>
</table>

10-2-08a (SPCN)
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

Preformed 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 millicandela per square foot per foot per foot-candle and shall be at least the following values when measured in the wheel path area.

<table>
<thead>
<tr>
<th>Color</th>
<th>Initial</th>
<th>Retained (after 1 Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>300</td>
<td>90</td>
</tr>
<tr>
<td>Yellow</td>
<td>200</td>
<td>70</td>
</tr>
</tbody>
</table>

**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             | 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:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preformed (width) Thermoplastic</td>
<td>Linear foot or Each</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement dotting</td>
<td>Mile</td>
</tr>
</tbody>
</table>

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