City of Virginia Beach
Amendments to the 2016 Virginia Department of Transportation Road and Bridge Specifications

October 1, 2017
NOTE:

The following Divisions II - VIII are amendments to the 2016 Virginia Department of Transportation Road and Bridge Specifications.
DIVISION II
MATERIALS
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**Division II – Materials**

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SECTION 200 - GENERAL

200.07 - Contractors Quality Control – add the following paragraphs

200.07 – Contractors Quality Control

(a) **Scope:** These requirements pertain to all Contractor Quality Control (CQC) testing, inspections, and submittals.

(b) **Purpose:** This is to assign to the Contractor responsibility for Quality Control of the project from the time of Notice to Proceed until final acceptance of the work by the Owner.

(c) **Testing:** The Contractor shall retain a VDOT approved testing laboratory to perform inspections, tests, and retesting in the event of failure of all items of work, including that of his subcontractors, to assure compliance with the contract provisions. The test results shall be signed by a Virginia Registered Professional Engineer. The Contractor Quality Control system will specifically include, but not limited to, the tests and inspections listed and/or required in the technical provisions of the contract specifications and shall cover all construction operations, including both on-site and off-site fabrication.

The minimum rate and location of sampling for the respective tests shall be determined by the VDOT Virginia Test Methods Manual (VTM) and the attached Minimum Job Acceptance Sampling Requirements.

**Note:** The Quality Assurance (QA) and Independent Assurance (IA) requirements shown in the Minimum Job Acceptance Sampling Requirements section of this specification are shown for informational purposes only and will be completed by the Owner independent of the Contractor Quality Control requirements.

(d) **Method of Measurement:** This item is considered incidental to the cost of furnishing and placing materials and will not be measured for payment.

(e) **Basis of Payment:** The cost of implementing Contractor Quality Control will not be measured separately and shall be considered incidental to other items.
### Minimum Job Acceptance Sampling Requirement

**Contractor Quality Control (QC) Frequency – Soil & Aggregate**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Specification Section</th>
<th>Test Reference</th>
<th>QC Frequency/Acceptance Testing (By Contractor)</th>
<th>QA Frequency, if Contractor Performed QC (By Owner)</th>
<th>IA Frequency, if Recommended (NHS required) (By Owner)</th>
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</thead>
<tbody>
<tr>
<td>Backfill</td>
<td>Contract Special Provisions</td>
<td>VTM-1, VTM-7 &amp; VTM-25</td>
<td>Once weekly during production and with change in material.</td>
<td>Once every 5 weeks during production</td>
<td>One test per year during production; minimally perform one in first 5 tests taken for QA</td>
</tr>
<tr>
<td>Moisture Density Relations – Standard Proctor, Atterberg Limits &amp; Grain Size Analysis (All Backfill Types)</td>
<td></td>
<td>VTM-012</td>
<td>Once Daily during production and with change in material.</td>
<td>Once weekly during production</td>
<td>One test per year during production; minimally perform one in first 5 tests taken for QA</td>
</tr>
<tr>
<td>One Point Proctor Check with Sand Cone Density-Compare to Nuclear Gauge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Place Density Tests:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Box Culverts &amp; Pipes</td>
<td>VTM-10</td>
<td>One (1) per 100 LF length, each lift, minimum one (1) test per 150 CY; minimum one (1) test per work shift at each location and whenever there is a change in material or compaction equipment/method.</td>
<td>One test per 1,500 CY with a minimum one test 10 ten days of production</td>
<td>One per 15,000 CY, minimally perform one test in first 5 tests taken for QA</td>
<td></td>
</tr>
<tr>
<td>Abutments, Retaining Walls and MSE Walls</td>
<td>VTM-10</td>
<td>One (1) per 100 LF length, each lift, minimum one (1) test per 150 CY; minimum one (1) test per work shift at each location and whenever there is a change in material or compaction equipment/method.</td>
<td>One test per 1,500 CY with a minimum one test every 10 days of production</td>
<td>One per 15,000 CY, minimally perform one test in first 5 tests taken for QA</td>
<td></td>
</tr>
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<td>Material Type</td>
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<td>-----------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Soils/Embankment</td>
<td></td>
<td></td>
<td>Once weekly during production and with change in material (Proctor for backfill will suffice if same source).</td>
<td>Once every 5 weeks during production One test per year during production</td>
<td>One test per year during production; minimally perform one in first 5 tests taken for QA</td>
</tr>
<tr>
<td>Moisture Density Relations-Standard Proctor, Atterberg Limits &amp; Grain Size Analysis (Soils/Embankment)</td>
<td>VTM-1, VTM-7 &amp; VTM-25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Point Proctor Check with Sand Cone Density-Compare to Nuclear Gauge (Soil/Embankment)</td>
<td>VTM-012</td>
<td></td>
<td>Once daily during production and with change in material (Proctor for backfill with suffice if same source).</td>
<td>Once weekly during production One test per year during production</td>
<td>One test per year during production; minimally perform one in first 5 tests taken for QA</td>
</tr>
<tr>
<td>Embankment in Place Density (Soils/Embankment)</td>
<td>VTM-10</td>
<td></td>
<td>One (1) per 500 LF interval each lift; minimum one (1) test per 500 CY; minimum one (1) test per work shift at each location and whenever there is a change in material or compaction equipment/method.</td>
<td>One test per 5,000 CY with a minimum one test every 10 days of production One per 100,000 CY, or fraction thereof, with minimum of one test per project</td>
<td></td>
</tr>
<tr>
<td>Subgrade</td>
<td>Section 305</td>
<td>VTM-10</td>
<td>One (1) test per 750 SY</td>
<td>One test per 7,500 SY</td>
<td>One test per 75,000 SY, minimally perform one (1) in first 5 taken for QA</td>
</tr>
</tbody>
</table>
## Minimum Job Acceptance Sampling Requirement

### Contractor Quality Control (QC) Frequency – Soil & Aggregate

<table>
<thead>
<tr>
<th>Material Type</th>
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</thead>
<tbody>
<tr>
<td>Treated Subgrade/Subbase, Aggregate Base Material, and Cement Treated Aggregate Base Material</td>
<td>VDOT Sections 306, 307 &amp; 309</td>
<td>VTM-38B</td>
<td>One (1) test per every half mile per lane width, minimum one (1) test per roadway.</td>
<td>One test for every 5 miles per lane width</td>
<td>One test per ten (1) roadway miles, or fraction thereof. Minimum of one per project, unless quantity of individual material (base, sub-base, etc.) is less than 500 tons per project, in which case no IA test required for that material</td>
</tr>
<tr>
<td>Depth Checks</td>
<td>VTM-38B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Place Density</td>
<td>VTM-10</td>
<td></td>
<td>One (1) test per every half mile of stabilization per lane width, average of 5 readings for each nuclear test minimum one (1) test per roadway.</td>
<td>One test for every 5 miles per lane width</td>
<td>One test per 10 roadway miles, or fraction thereof, consisting of the average of five readings. Minimum of five readings per project, unless total quantity of individual material (base, sub-base, etc.) is less than 500 tons per project, in which case no IA test</td>
</tr>
<tr>
<td>Clearing and Grubbing</td>
<td>VDOT Section 301</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensure activities are confined to limits and seeded within 30 days of disturbance</td>
<td></td>
<td></td>
<td>N/A</td>
<td>Daily</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

- Depth Checks: One test per every half mile per lane width, minimum one (1) test per roadway.
- In Place Density: One test per every half mile of stabilization per lane width, average of 5 readings for each nuclear test, minimum one (1) test per roadway.
- Clearing and Grubbing: Ensure activities are confined to limits and seeded within 30 days of disturbance.
**Minimum Job Acceptance Sampling Requirement**

*Contractor Quality Control (QC) Frequency – Soil & Aggregate*

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<tr>
<td>Erosion and Siltation Control</td>
<td>VDOT Section 303.03 &amp; current Virginia DCR Specifications</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor for correct installation and Maintenance</td>
<td>N/A</td>
<td>Daily</td>
<td>Weekly</td>
<td></td>
<td></td>
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<tr>
<td><strong>Undercut</strong></td>
<td>VDOT Section 303.04</td>
<td>N/A</td>
<td>Prior to start of work at each location</td>
<td>All reports reviewed by Locality Project Manager to verify qualified inspector and correct equipment</td>
<td>One QA report reviewed per month during production to verify qualified inspector and qualified personnel</td>
</tr>
<tr>
<td>Review area to determine need for Undercut</td>
<td>N/A</td>
<td>Prior to start of work at each location</td>
<td>All reports reviewed by Locality Project Manager to verify qualified inspector and correct equipment</td>
<td>One QA report reviewed per month during production to verify qualified inspector and qualified personnel</td>
<td></td>
</tr>
<tr>
<td>Measure Undercut Area</td>
<td>N/A</td>
<td>Prior to backfill at each location</td>
<td>All calculations/reports checked/reviewed by Locality Project Manager to verify qualified inspector and correct equipment</td>
<td>One QC calculation/report checked/reviewed to verify qualified inspector and correct equipment</td>
<td></td>
</tr>
<tr>
<td><strong>Overlay Sands</strong></td>
<td>Grade D Silica Sand</td>
<td>One bag per project</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
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### Minimum Job Acceptance Sampling Requirement

#### Contractor Quality Control (QC) Frequency – Hydraulic Cement Concrete

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<td>Cast-In-Place (CIP) Structures and Bridge Concrete</td>
<td>VDOT Section 217</td>
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<tr>
<td>Concrete Entrained Air Content (CIP Concrete)</td>
<td>ASTM C231 or C173</td>
<td>Test every load</td>
<td>One per 100 CY</td>
<td>One test shall be made on the same batches of concrete from which cylinders taken.</td>
<td></td>
</tr>
<tr>
<td>Slump of Hydraulic Cement Concrete (CIP Concrete)</td>
<td>ASTM 143</td>
<td>Test every load</td>
<td>One per 100 CY</td>
<td>One test shall be made on the same batches of concrete from which cylinders taken.</td>
<td></td>
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<tr>
<td>Temperature of Concrete (CIP Concrete)</td>
<td>ASTM C1064</td>
<td>Test every load</td>
<td>One per 100 CY</td>
<td>One per 500 CY, minimally one in first 5 tests taken for QA.</td>
<td></td>
</tr>
<tr>
<td>Concrete Unit Weight</td>
<td>ASTM C138</td>
<td>Test every load</td>
<td>One per 100 CY</td>
<td>One per 500 CY, minimally one in first 5 tests taken for QA.</td>
<td></td>
</tr>
<tr>
<td>Compressive Strength of Concrete Cylinders (CIP Concrete)</td>
<td>ASTM C31 &amp; C39</td>
<td>One (1) set of 3 cylinders per every 100 CY and at least one (1) set per day with minimum of two (2) sets of cylinders per structure per class of concrete.</td>
<td>One set of 3 cylinders per every 1,000 CY. Minimum of one sample per project</td>
<td>Minimum one set per 1,000 C.Y. of structural concrete, except that IA sample will not be required for projects having less than 300 C.Y. If more than one set is needed per project, the samples should be taken from different classes.</td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Specification Section</td>
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<td>QC Frequency/Acceptance Testing (By Contractor)</td>
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<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Chloride Permeability Concrete Cylinders (CIP Concrete)</td>
<td>VTM-112</td>
<td>One (1) set of two (2) cylinders per every 100 CY and at least one set per day.</td>
<td>One set of 2 cylinders per every 1,000 CY. Minimum of one sample per project</td>
<td>Minimum one set per 1,000 C.Y. of structural concrete, except that IA sample will not be required for projects having less than 300 C.Y. If more than one set is needed per project, the samples should be taken from different classes. One set of two.</td>
<td></td>
</tr>
<tr>
<td>Concrete Reinforcing Steel (CIP Concrete) elongation, yield strength and ultimate strength</td>
<td>ASTM A615</td>
<td>Verify manufacturers’ certificates for every shipment for acceptance prior to placement.</td>
<td>One sample per manufacturer per most common size per structure</td>
<td>One sample per project</td>
<td></td>
</tr>
<tr>
<td>Pavement</td>
<td>VDOT Section 217</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Entrained Air Content (Pavement)</td>
<td>ASTM C231 or C173</td>
<td>One (1) test per hour and when casting Flexural Beams.</td>
<td>One test per day</td>
<td>One test shall be made on the same batches of concrete from which cylinders taken</td>
<td></td>
</tr>
<tr>
<td>Slump of Hydraulic Cement Concrete (Pavement)</td>
<td>ASTM 143</td>
<td>One (1) test per hour and when casting Flexural Beams.</td>
<td>One test per day</td>
<td>One test shall be made on the same batches of concrete from which cylinders taken</td>
<td></td>
</tr>
<tr>
<td>Temperature of Concrete (Pavement)</td>
<td>ASTM C1064</td>
<td>Test every load</td>
<td>One per 100 CY</td>
<td>One per 500 CY, minimally one in first 5 tests taken for QA</td>
<td></td>
</tr>
<tr>
<td>Concrete Unit Weight</td>
<td>ASTM C138</td>
<td>One (1) test per hour and when casting Flexural Beams.</td>
<td>One test per day</td>
<td>One per 500 CY, minimally one in first 5 tests taken for QA</td>
<td></td>
</tr>
</tbody>
</table>
# Minimum Job Acceptance Sampling Requirement

**Contractor Quality Control (QC) Frequency – Hydraulic Cement Concrete**

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<tr>
<th>Material Type</th>
<th>Specification Section</th>
<th>Test Reference</th>
<th>QC Frequency/Acceptance Testing (By Contractor)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Compressive Strength of Concrete Cylinders (Pavement)</td>
<td>ASTM C31 &amp; C39</td>
<td>One (1) set of 3 cylinders cast for every 100 CY and at least one for each days concreting operation.</td>
<td>One set of 3 cylinders per every 1,000 CY minimum of one set per project</td>
<td>Minimum one set per 1,000 C.Y. of structural concrete, except that IA sample will not be required for projects having less than 300 C.Y. If more than one set is needed per project, the samples should be taken from different classes.</td>
<td>One set of three.</td>
</tr>
<tr>
<td>Flexural Strength Beams</td>
<td>ASTM C31 &amp; C39</td>
<td>At least one (1) beam cast for each days concreting operation.</td>
<td>Minimum of one beam per week</td>
<td>Minimum of one beam per month</td>
<td>Minimum of one beam per month</td>
</tr>
<tr>
<td>Chloride Permeability Concrete Cylinders (CIP Concrete)</td>
<td>VTM-112</td>
<td>One (1) set of 2 cylinders per every 100 CY and at least one (1) set per day.</td>
<td>One set of 2 cylinders per every 1,000 CY minimum of one set per project</td>
<td>Minimum one set per 1,000 C.Y. of structural concrete, except that IA sample will not be required for projects having less than 300 C.Y. If more than one set is needed per project, the samples should be taken from different classes.</td>
<td>One set of two.</td>
</tr>
<tr>
<td>Concrete Reinforcing Steel (Pavement) elongation, yield strength and ultimate strength</td>
<td>ASTM A615</td>
<td>Verify manufacturers’ certificates for every shipment for acceptance prior to placement.</td>
<td>One sample per manufacture per most common size for every 2 lane miles</td>
<td>Minimum one set per 2 lane miles.</td>
<td>Minimum one set per 2 lane miles.</td>
</tr>
</tbody>
</table>

Division II - 10
# Minimum Job Acceptance Sampling Requirement

**Contractor Quality Control (QC) Frequency – Hydraulic Cement Concrete**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous Concrete</td>
<td>VDOT Section 217</td>
<td>ASTM C231 &amp; C173</td>
<td>One (1) test per hour and when cylinders are cast.</td>
<td>One test per day</td>
<td>One per 10,000 CY, minimally one in first 5 tests taken for QA</td>
</tr>
<tr>
<td>Concrete Entrained Air Content (Miscellaneous Concrete)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slump of Hydraulic Cement Concrete (Miscellaneous Concrete)</td>
<td>ASTM C143</td>
<td>One (1) test per hour and when cylinders are cast.</td>
<td>One test per day</td>
<td>One per 10,000 CY, minimally one in first 5 tests taken for QA</td>
<td></td>
</tr>
<tr>
<td>Temperature of Concrete (Miscellaneous Concrete)</td>
<td>ASTM C1064</td>
<td>One (1) test per hour and when cylinders are cast.</td>
<td>One test per day</td>
<td>One per 10,000 CY, minimally one in first 5 tests taken for QA</td>
<td></td>
</tr>
<tr>
<td>Concrete Unit Weight</td>
<td>ASTM C138</td>
<td>One (1) test per hour and when cylinders are cast.</td>
<td>One test per day</td>
<td>One per 10,000 CY, minimally one in first 5 tests taken for QA</td>
<td></td>
</tr>
<tr>
<td>Compressive Strength of Concrete Cylinders (Miscellaneous Concrete)</td>
<td>ASTM C31 &amp; C39</td>
<td>One (1) set of 3 cylinders per every 250 CY and at least one (1) set per day.</td>
<td>One set of 3 cylinders per every 2,500 CY (cumulative)</td>
<td>One set of 3 cylinders per every 25,000 CY (cumulative)</td>
<td></td>
</tr>
<tr>
<td>Concrete Reinforcing Steel (Miscellaneous Concrete)</td>
<td>ASTM A615</td>
<td>Verify manufacturers’ certificates for every shipment for acceptance prior to placement.</td>
<td>One sample per manufacture per most common size per structure</td>
<td>One sample per project</td>
<td></td>
</tr>
</tbody>
</table>
# Minimum Job Acceptance Sampling Requirement

## Contractor Quality Control (QC) Frequency – Hydraulic Cement Concrete

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<tbody>
<tr>
<td><strong>Concrete Curing Materials</strong></td>
<td>VDOT Section 220</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Burlap</td>
<td></td>
<td>AASHTO M182, Class 3</td>
<td>Verification of LM number and lot numbers if from QA Supplier Approved list 44, if not one sample per lot number.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>White Liquid Membrane Curing Compound</td>
<td></td>
<td>VTM-2</td>
<td>Verification of LM number and batch numbers if from QA Supplier Approved list 44, if not one sample per batch number.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Fugitive Dye Liquid Membrane Curing Compound</td>
<td></td>
<td>VTM-2</td>
<td>Verification of LM number and batch numbers if from QA Supplier Approved list 44, if not one sample per batch number.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Polyethylene Film</td>
<td></td>
<td>AASHTO M171</td>
<td>Verification of LM number and batch numbers if from QA Supplier Approved list 44, if not one sample per lot number.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
# Minimum Job Acceptance Sampling Requirement

## Contractor Quality Control (QC) Frequency – Asphalt

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Specification Section</th>
<th>Test Reference</th>
<th>QC Frequency/Acceptance Testing (By Contractor)</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Asphalt Concrete Placement</strong></td>
<td>VDOT Section 315</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pavement Density by Nuclear Method with In Place Pavement Density (Asphalt Pavement)</td>
<td>VTM-76, VTM-6</td>
<td>Establish Roller pattern, control strips and test sections, ten (10) stratified random density test sites per test section (5,000 ft.).</td>
<td>QA=20%*QC Lots Acceptance Options: 1) e.g. 25,000 ft. (7,500 m) per lane width. Ten stratified random samples per QA lot. Limits of QA lot should match limits of one QC lot. OR 2) Coring/Saw plugs method use AASHTO T-166/5 cores/plugs</td>
<td>IA=10%*QC Readings Locality representative observe and witness QC testing to assure gauge is calibrated and accurate. Observe and verify test sites are random and match selected sites. Verify that QC tests are done using proper procedure.</td>
<td></td>
</tr>
<tr>
<td>In Place Pavement Density (for all asphalt except Stone Matrix Asphalt (SMA))</td>
<td>VTM-006, VTM-32</td>
<td><strong>Density</strong> – minimum one (1) core per location not long enough to establish roller pattern/control strip.</td>
<td><strong>Density</strong> – One random core per ten QC locations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Place Pavement Density (for all asphalt except Stone Matrix Asphalt (SMA))
# Minimum Job Acceptance Sampling Requirement

## Contractor Quality Control (QC) Frequency – Asphalt

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<tr>
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</thead>
<tbody>
<tr>
<td>Asphalt Concrete Placement</td>
<td>VDOT Section 315</td>
<td>VTM-32</td>
<td>One (1) per ¼ mile per lane width, minimum one (1) test per roadway, maximum lot size one (1) mile (4 tests).</td>
<td></td>
<td>One test for every 50 miles per lane width, minimum one test per roadway. Also, depth tests of intermediate or surface material required only if specific plan depths are called for, not when plans specify rate of application</td>
</tr>
<tr>
<td>Depth Checks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Place Pavement Density and Depth Checks by cores for Stone Matrix Asphalt (SMA)</td>
<td>VTM-006</td>
<td></td>
<td>Minimum of one (1) sample per 1,000 feet with a maximum of five (5) samples per day/night’s production for density and depth. Three (3) cores for test strip.</td>
<td>Locality Representative Independently weigh and measure one QC core per day/night’s production QA will observe the taking of these cores and will maintain control of these cores once obtained</td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Specification Section</td>
<td>Test Reference</td>
<td>QC Frequency/Acceptance Testing (By Contractor)</td>
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</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------</td>
<td>----------------</td>
<td>------------------------------------------------</td>
<td>-------------------------------------------------</td>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>Permanent Pavement Marking</td>
<td>VDOT Section 704</td>
<td>VTM-94</td>
<td>Daily at start up with periodic checks every three (3) hours of operation.</td>
<td>Randomly select ten 20 foot in place sections of markings per day and measure thickness and width. Observe the bead embedment, color (night and day) and brightness/reflectivity. Inspect structure of tape to ensure patterned waffles have not been damaged.</td>
<td>Review two C-85 reports per month during production to verify that calculated quantities match application rates and that daily measurements are performed according to VTM 94.</td>
</tr>
<tr>
<td>Permanent Pavement Marking – Preformed Tape</td>
<td></td>
<td>VTM-94</td>
<td>Daily at start up with periodic checks every three (3) hours of operation.</td>
<td>Randomly select ten 20 foot in place sections of markings per day and measure thickness and width. Observe the bead embedment, color (night and day) and brightness/reflectivity. Review application rates to ensure proper thickness has been applied.</td>
<td>Review two C-85 reports per month during production to verify that calculated quantities match application rates and that daily measurements are performed according to VTM 94.</td>
</tr>
<tr>
<td>Permanent Pavement Marking – Liquid Materials (Paint, thermoplastic and epoxy)</td>
<td></td>
<td>VTM-94</td>
<td>Daily at start up with periodic checks every three (3) hours of operation.</td>
<td>Randomly select ten 20 foot in place sections of markings per day and measure thickness and width. Observe the bead embedment, color (night and day) and brightness/reflectivity. Review application rates to ensure proper thickness has been applied.</td>
<td>Review two C-85 reports per month during production to verify that calculated quantities match application rates and that daily measurements are performed according to VTM 94.</td>
</tr>
</tbody>
</table>
## Minimum Job Acceptance Sampling Requirement

**Contractor Quality Control (QC) Frequency – Miscellaneous Roadway and Structure**

<table>
<thead>
<tr>
<th>Material Type</th>
<th>Specification Section</th>
<th>Test Reference</th>
<th>QC Frequency/Acceptance Testing (By Contractor)</th>
<th>QA Frequency, if Contractor Performed QC (By Owner)</th>
<th>IA Frequency, if Recommended (NHS required) (By Owner)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-cast Structures</strong></td>
<td>VDOT Section 404</td>
<td>N/A</td>
<td>Daily and when shipment arrives on project.</td>
<td>weekly</td>
<td></td>
</tr>
<tr>
<td>Verify bedding material is installed properly and that pre-cast materials are not chipped or cracked</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Load Bearing Piles</strong></td>
<td>VDOT Section 403</td>
<td>N/A</td>
<td>Continuously</td>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Monitor Operation and Document Blow Counts</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform Center of Gravity Calculations</td>
<td>N/A</td>
<td>N/A</td>
<td>For each Foundation</td>
<td>One out of every 10 foundations</td>
<td></td>
</tr>
<tr>
<td><strong>Structural Steel</strong></td>
<td>VDOT Section 407</td>
<td>ASTM 325</td>
<td>Minimum one bolt per connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check of Torque of Bolts</td>
<td>ASTM 325</td>
<td>N/A</td>
<td>10% of bolts but not fewer than 2 in any connection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rebar Splicer (Tension Test)</td>
<td>ASTM A615</td>
<td>N/A</td>
<td>One sample per manufacturer per most common size per structure (Contractor is to install pieces).</td>
<td>One sample per manufacturer per most common size per project (Contractor is to install pieces)</td>
<td>Verify Machine Calibration annually</td>
</tr>
<tr>
<td>Prestressing Strand Splicer (Tension Test)</td>
<td>ASTM A615</td>
<td>N/A</td>
<td>One sample per manufacturer per most common size per structure.</td>
<td>Two sample per manufacturer per most common size per project</td>
<td>Verify Machine Calibration annually</td>
</tr>
<tr>
<td>Material Type</td>
<td>Specification Section</td>
<td>Test Reference</td>
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<td>---------------------------------------------------</td>
<td>------------------------</td>
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<td>-----------------------------------------------</td>
<td>---------------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Protective Coating of Metal in Structures</td>
<td>VDOT Section 411</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor Surface Preparation</td>
<td>SSPC-PA</td>
<td>Three (3) surface profile measurements per day of blasting.</td>
<td>Two surface profile measurements per week of blasting</td>
<td></td>
<td>Review all reports showing the preparation protocols</td>
</tr>
<tr>
<td>Check Coating Thickness according to SSPC-PA</td>
<td>SSPC-PA</td>
<td>Five (5) spot measurements 15 readings per day as defined in PA-2 for coating thickness after each layer of paint at each location.</td>
<td>One spot measurement 3 readings as defined in PA-2 for coating thickness after each layer of paint at each location</td>
<td>Review all reports showing-painting application rates including the tests performed on profiles and thicknesses</td>
<td></td>
</tr>
<tr>
<td>Underdrains</td>
<td>VDOT Section 501</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect to ensure no deficiencies</td>
<td>VTM-108</td>
<td>All accessible outlet locations; Additionally a minimum of 10% of longitudinal sections.</td>
<td>Observe 10% of outlet locations; additionally, a minimum of 1% of longitudinal sections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guardrail</td>
<td>VDOT Section 505</td>
<td></td>
<td>Daily</td>
<td>Spot-check every 50 linear feet for proper height</td>
<td></td>
</tr>
<tr>
<td>Material Type</td>
<td>Specification Section</td>
<td>Test Reference</td>
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<td>------------------------</td>
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<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Fencing</td>
<td>VDOT Section 507</td>
<td>N/A</td>
<td>Daily</td>
<td>Weekly</td>
<td></td>
</tr>
<tr>
<td>Verify fencing type, height and location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barbed Wire</td>
<td>VDOT Section 242</td>
<td>ASTM A121</td>
<td>One sample every 50 rolls or spools.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Chain link Fence</td>
<td>VDOT Section 242</td>
<td>AASHTO M181</td>
<td>One sample from three (3) rolls for every fifty (50) rolls.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ROW Monuments</td>
<td>VDOT Section 503</td>
<td>N/A</td>
<td>10% of ROW Monuments.</td>
<td>1% of ROW monuments</td>
<td></td>
</tr>
<tr>
<td>Verify monument type and location</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of Traffic</td>
<td>VDOT Section 512</td>
<td>N/A</td>
<td>Daily (locality Inspector).</td>
<td>Weekly (Locality Project Manager)</td>
<td></td>
</tr>
<tr>
<td>Monitor installation and maintenance and use Work Zone Safety Checklist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Minimum Job Acceptance Sampling Requirement

**Contractor Quality Control (QC) Frequency – Miscellaneous Roadway and Structure**

<table>
<thead>
<tr>
<th>Material Type</th>
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<th>QC Frequency/Acceptance Testing (By Contractor)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Sound Wall Barriers</td>
<td>VDOT Section 519</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify location and installation with shop drawings</td>
<td>N/A</td>
<td>Daily</td>
<td>Weekly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topsoil and Seeding</td>
<td>VDOT Section 602/603</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify proper material is utilized at application rates from plans</td>
<td>N/A</td>
<td>Daily</td>
<td>Weekly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic Signs</td>
<td>VDOT Section 512</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verify that signs meeting current standards are utilized in locations per plans</td>
<td>N/A</td>
<td>Daily</td>
<td>Weekly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic Signals</td>
<td>VDOT Section 703</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor installation for conformance with plans and specifications</td>
<td>N/A</td>
<td>Daily</td>
<td>Weekly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Minimum Job Acceptance Sampling Requirement

**Contractor Quality Control (QC) Frequency – Miscellaneous Roadway and Structure**

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</tr>
</thead>
<tbody>
<tr>
<td><strong>Water and Sewer Facilities</strong></td>
<td>VDOT Section 520</td>
<td>N/A</td>
<td>Daily</td>
<td>Weekly</td>
<td></td>
</tr>
<tr>
<td>Monitor installation for conformance with plans and specifications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electrical and Signal Components</strong></td>
<td>VDOT Section 238</td>
<td>ASTM A475</td>
<td>One (1) sample per project.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Tether Wire</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Span Wire</td>
<td></td>
<td>ASTM A475</td>
<td>One (1) sample per project.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Masonry</strong></td>
<td>VDOT Section 202</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall Units</td>
<td></td>
<td></td>
<td>One (1) sample consisting of ten (10 units per 10,000 units)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SECTION 203 – COARSE AGGREGATE

203.02 – Materials – is amended as follow

(a) Crushed hydraulic cement concrete – add the following sentence

  Crushed hydraulic cement concrete shall not contain any wire.

SECTION 205 – CRUSHER RUN AGGREGATE

205.02 – Materials – is amended as follow

(a) Crushed hydraulic cement concrete – add the following sentence

  Crushed hydraulic cement concrete shall not contain any wire.

SECTION 207 - SELECT MATERIAL

207.04 - Mixing - replaces with the following paragraph

The Contractor is to supply to the Owner laboratory Proctor tests and CBR tests certified by a Professional Engineer of each source of supply and for every 500 CY of select material delivered on-site to insure compliance with these specifications. See Section 200.07, Contractor Quality Control, for further information.

SECTION 208 - SUBBASE AND AGGREGATE BASE MATERIAL

208.02 – Materials – is amended as follow

(a) Subbase materials – add the following sentence

  Crushed hydraulic cement concrete shall not contain any wire.

(b) Aggregate base materials – add the following sentence

  Crushed hydraulic cement concrete used in Type I and Type II shall not contain any wire.

208.05 - Mixing - add the following paragraph

It is the Contractor's responsibility to insure that subbase and aggregate base material delivered to the job site meets the specifications stated herein.

Section 208.06 - Acceptance – replace the sixth paragraph with the following

If the liquid limit exceeds 30 or the plasticity index exceeds 6 for Type I base material or No. 19 subbase material; or the plasticity index exceeds 9 for Type II base material or subbase materials No. 20, 21, 21A, 21B, or 22 on any individual sample; that portion of the lot from which the sample was taken will be considered a separate part of the lot and the Contractor shall remove that portion from the roadway.
SECTION 210 - ASPHALT MATERIALS

210.02 – Materials – is amended as follow

(g) Polymer Modified Cationic Emulsified Asphalt – replaces with the following paragraph

Polymer Modified Cationic Emulsified Asphalt shall conform to AASHTO M316. The softening point shall have a minimum value of 100°F.

210.07 – Tests

(c) Emulsified Asphalts:

1. Certified Test Reports for Emulsified Asphalts
   
   c. Latex Modified Cationic Emulsions (Quick Set) - is amended as follow

   (2) CRS-2 Latex - replace with the following paragraphs

   (a) Tests on Emulsions

   • Saybolt Furol Viscosity
   • Sieve Test (if necessary)
   • Particle Charge Test
   • Residue by Evaporation

   (b) Tests on residue by Evaporation

   • Penetration
   • Ring and Ball Softening Point
   • Elastic Recovery
   • Ductility, 25°C, 5 cm/min

210.07 – Tests – is amended with the following

(d) Non-Tracking Tack: - replaces with the following paragraphs

Certified Test Reports for Non-Tracking Tack shall be based upon the results of tests performed, as specified below:

1. Tests on Non-Tracking Tack:

   • Residue by Distillation

2. Tests on residue by distillation:

   • Ring and Ball Softening Point
   • Penetration
SECTION 211 - ASPHALT CONCRETE is amended as follow

211.01 – Description - replaces with the following paragraphs

Asphalt concrete shall consist of a combination of mineral aggregate and asphalt material mixed mechanically in a plant specifically designed for such purpose.

An equivalent single-axle load (ESAL) will be established by the Engineer, and SUPERPAVE mix types may be specified as one of the types listed as follows:

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>Equivalent Single-Axle Load (ESAL) Range</th>
<th>Minimum Asphalt Performance Grade (PG)¹</th>
<th>Aggregate Nominal Maximum Size²</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-9.0A</td>
<td>0 to 3</td>
<td>64S-16</td>
<td>3/8 in</td>
</tr>
<tr>
<td>SM-9.0D</td>
<td>3 to 10</td>
<td>64H-16</td>
<td>3/8 in</td>
</tr>
<tr>
<td>SM-9.0E</td>
<td>Above 10</td>
<td>64E-22</td>
<td>3/8 in</td>
</tr>
<tr>
<td>SM-9.5A</td>
<td>0 to 3</td>
<td>64S-16</td>
<td>3/8 in</td>
</tr>
<tr>
<td>SM-9.5D</td>
<td>3 to 10</td>
<td>64H-16</td>
<td>3/8 in</td>
</tr>
<tr>
<td>SM-9.5E</td>
<td>Above 10</td>
<td>64E-22</td>
<td>3/8 in</td>
</tr>
<tr>
<td>SM-12.5A</td>
<td>0 to 3</td>
<td>64S-16</td>
<td>1/2 in</td>
</tr>
<tr>
<td>SM-12.5D</td>
<td>3 to 10</td>
<td>64H-16</td>
<td>1/2 in</td>
</tr>
<tr>
<td>SM-12.5E</td>
<td>Above 10</td>
<td>64E-22</td>
<td>1/2 in</td>
</tr>
<tr>
<td>IM-19.0A</td>
<td>Less than 10</td>
<td>64S-16</td>
<td>3/4 in</td>
</tr>
<tr>
<td>IM-19.0D</td>
<td>10 to 20</td>
<td>64H-16</td>
<td>3/4 in</td>
</tr>
<tr>
<td>IM-19.0E</td>
<td>20 and above</td>
<td>64E-22</td>
<td>3/4 in</td>
</tr>
<tr>
<td>BM-25.0A</td>
<td>All ranges</td>
<td>64S-16</td>
<td>1 in</td>
</tr>
<tr>
<td>BM-25.0D</td>
<td>Above 10</td>
<td>64H-16</td>
<td>1 in</td>
</tr>
</tbody>
</table>

¹Minimum Asphalt Performance Grade (PG) is defined as the minimum binder performance grade for the job mixes as determined by AASHTO T170 or AASHTO M332.

²Aggregate Nominal Maximum Size is defined as one sieve size larger than the first sieve to retain more than 10 percent aggregate.

Note: SM = Surface Mixture; IM = Intermediate Mixture; BM = Base Mixture

Asphalt concrete shall conform to the requirements for the mix type designated on the plans or elsewhere in the Contract for use.

At the Contractor’s option, an approved Warm Mix Asphalt (WMA) additive or process may be used to produce the asphalt concrete (AC) mix type designated.

211.03 – Job-Mix Formula - is amended as follow

(d) SUPERPAVE design test data replaces Tables II-13 and II-14 with the following tables
TABLE II-13
Asphalt Concrete Mixtures: Design Range¹

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>2 in</th>
<th>1 1/2 in</th>
<th>1 in</th>
<th>¾ in</th>
<th>½ in</th>
<th>3/8 in</th>
<th>No. 4</th>
<th>No. 8</th>
<th>No. 30</th>
<th>No. 50</th>
<th>No. 200</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-9.0 A,D,E</td>
<td>100</td>
<td>90-100</td>
<td>90</td>
<td>47-67</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SM-9.5 A,D,E</td>
<td>100</td>
<td>90-100</td>
<td>90</td>
<td>58-80</td>
<td>38-67</td>
<td></td>
<td></td>
<td></td>
<td>23 max</td>
<td>2-10</td>
<td></td>
</tr>
<tr>
<td>SM-12.5 A,D,E</td>
<td>100</td>
<td>90-100</td>
<td>90</td>
<td>58-80</td>
<td>34-50</td>
<td></td>
<td></td>
<td></td>
<td>23 max</td>
<td>2-10</td>
<td></td>
</tr>
<tr>
<td>IM-19.0 A,D,E</td>
<td>100</td>
<td>90-100</td>
<td>90</td>
<td>--</td>
<td>--</td>
<td>28-49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2-8</td>
</tr>
<tr>
<td>BM-25.0 A,D</td>
<td>100</td>
<td>90-100</td>
<td>90</td>
<td>--</td>
<td>--</td>
<td>19-38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-7</td>
</tr>
<tr>
<td>C (Curb Mix)</td>
<td>100</td>
<td>92-100</td>
<td>70-75</td>
<td>50-60</td>
<td>28-36</td>
<td>15-20</td>
<td>7-9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹A production tolerance of 1% will be applied to this sieve regardless of the number of tests in the lot.

TABLE II-14
Mix Design Criteria

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>VTM (%) Production</th>
<th>VFA (%) Design</th>
<th>VFA (%) Production</th>
<th>Min. VMA (%)</th>
<th>Fines/Asphalt Ratio</th>
<th>No. of Gyration N Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-9.0A ¹,²</td>
<td>2.0-5.0</td>
<td>75-80</td>
<td>70-85</td>
<td>16</td>
<td>0.6-1.3</td>
<td>65</td>
</tr>
<tr>
<td>SM-9.0D ¹,²</td>
<td>2.0-5.0</td>
<td>75-80</td>
<td>70-85</td>
<td>16</td>
<td>0.6-1.3</td>
<td>65</td>
</tr>
<tr>
<td>SM-9.0E ¹,²</td>
<td>2.0-5.0</td>
<td>75-80</td>
<td>70-85</td>
<td>16</td>
<td>0.6-1.3</td>
<td>65</td>
</tr>
<tr>
<td>SM-9.5A ¹,²</td>
<td>2.0-5.0</td>
<td>75-80</td>
<td>70-85</td>
<td>16</td>
<td>0.7-1.3</td>
<td>50</td>
</tr>
<tr>
<td>SM-9.5D ¹,²</td>
<td>2.0-5.0</td>
<td>75-80</td>
<td>70-85</td>
<td>16</td>
<td>0.7-1.3</td>
<td>50</td>
</tr>
<tr>
<td>SM-9.5E ¹,²</td>
<td>2.0-5.0</td>
<td>75-80</td>
<td>70-85</td>
<td>16</td>
<td>0.7-1.3</td>
<td>50</td>
</tr>
<tr>
<td>SM-12.5A ¹,²</td>
<td>2.0-5.0</td>
<td>73-79</td>
<td>68-84</td>
<td>15</td>
<td>0.7-1.3</td>
<td>50</td>
</tr>
<tr>
<td>SM-12.5D ¹,²</td>
<td>2.0-5.0</td>
<td>73-79</td>
<td>68-84</td>
<td>15</td>
<td>0.7-1.3</td>
<td>50</td>
</tr>
<tr>
<td>SM-12.5E ¹,²</td>
<td>2.0-5.0</td>
<td>73-79</td>
<td>68-84</td>
<td>15</td>
<td>0.7-1.3</td>
<td>50</td>
</tr>
<tr>
<td>IM-19.0A ¹,²</td>
<td>2.0-5.0</td>
<td>69-76</td>
<td>64-81</td>
<td>13</td>
<td>0.6-1.2</td>
<td>65</td>
</tr>
<tr>
<td>IM-19.0D ¹,²</td>
<td>2.0-5.0</td>
<td>69-76</td>
<td>64-81</td>
<td>13</td>
<td>0.6-1.2</td>
<td>65</td>
</tr>
<tr>
<td>IM-19.0E ¹,²</td>
<td>2.0-5.0</td>
<td>69-76</td>
<td>64-81</td>
<td>13</td>
<td>0.6-1.2</td>
<td>65</td>
</tr>
<tr>
<td>BM-25.0A ²,³</td>
<td>1.0-4.0</td>
<td>67-87</td>
<td>67-92</td>
<td>12</td>
<td>0.6-1.3</td>
<td>65</td>
</tr>
<tr>
<td>BM-25.0D ²,³</td>
<td>1.0-4.0</td>
<td>67-87</td>
<td>67-92</td>
<td>12</td>
<td>0.6-1.3</td>
<td>65</td>
</tr>
</tbody>
</table>

¹Asphalt content should be selected at 4.0% air voids for A & D mixes, 3.5% air voids for E mix.
²Fines-asphalt ratio is based on effective asphalt content.
³Base mix shall be designed at 2.5% air voids. BM-25A shall have a minimum asphalt content of 4.4% unless otherwise approved by the Owner. BM-25D shall have a minimum asphalt content of 4.6% unless otherwise approved by the Owner.

211.05 – Testing deleting the eighth and ninth paragraphs

SECTION 212—JOINT MATERIALS

212.02 – Detail Requirements - is amended as follows

(h)  Gaskets for pipe - replaces with the following paragraph
(h) **Gaskets for pipe** and box culvert sections shall conform to the following: Rubber gaskets for ductile iron pipe and fittings shall conform to AWWA C111. Rubber gaskets for concrete and metal pipe shall conform to ASTM C443. Rubber gaskets for plastic pipe shall conform to ASTM F 477. Flexible cellular sponge or expanded rubber gaskets for metal pipe shall conform to ASTM D1056. Gaskets for box culvert sections shall conform to ASTM C1677. All gaskets shall conform to the ozone cracking resistance described in Section 237.02 of the Specifications.

**SECTION 213 - DAMP-PROOFING AND WATERPROOFING MATERIALS**

213.02 - **Detail Requirements** - *is amended as follow*

**(d) Membrane - replaces with the following paragraphs**

Membrane shall conform to one of the following systems:

1. **System A:**
   a. **Primer** - The primer shall be reduced in a volatile solvent and shall be of suitable consistency for application by brush, roller, or spray without further dilution. The primer base shall be compatible with the membrane and shall be designated by the membrane manufacturer.
   b. **Membrane** - The membrane shall be a laminate formed with suitably plasticized coal tar and reinforced with nonwoven synthetic fibers or glass fibers. It shall be free from blemishes, discontinuities or other defects. The membrane shall be supplied in rolls conforming to the following requirements:

      | Requirement                          | Value            |
      |--------------------------------------|-----------------|
      | Thickness (min.)                     | 65 mils         |
      | Pliability: 180/bend over 1” mandrel at 10/F | No Cracks       |
      | Softening Point                      | 225 /F to 260 /F ASTM D36 |
      | Weight (lbs. /sq.ft.min.).45         |                 |

2. **System B:**
   a. **Primer** - The primer shall be of a base compatible with the membrane and recommended by the membrane manufacturer. It shall be reduced in a volatile solvent for application by brush or roller without further dilution.
   b. **Membrane** - The membrane shall be laminate of rubberized asphalt and reinforced with synthetic fibers or mesh. It shall be uniformly manufactured, free from blemishes, discontinuities, or other defects. The membrane shall be supplied in rolls having a width of 36” or other widths as approved by the Owner, and shall conform to the following requirements:
<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness (min.)</td>
<td>65 mils</td>
</tr>
<tr>
<td>Tensile Strength (min.) 50 lb./inch width</td>
<td>ASTM D882, Method A</td>
</tr>
<tr>
<td>Puncture Resistance (mesh)</td>
<td>200 lbs.</td>
</tr>
<tr>
<td>Pliability: 180/bend over 1&quot; mandrel at 10 /F</td>
<td>No Cracks</td>
</tr>
<tr>
<td>Water Vapor Permeability</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>ASTM D146, Method B</td>
</tr>
</tbody>
</table>

c. **Mastic** - The mastic shall be a cold-applied rubberized asphalt composition as designated by the manufacturer of the membrane.

3. **System C:**

a. **Primer** - The primer shall be of a synthetic rubber and resin base compatible with the membrane as recommended by the membrane manufacturer. It shall be reduced in a volatile organic solvent and shall be of suitable consistency for application by brush or roller with dilution.

b. **Membrane** - The membrane shall be a laminate of suitable plasticized asphalt, reinforced with open weave fiber glass mesh, and having a thin polyester top surface film. It shall be uniformly manufactured, free from blemishes, discontinuities, or other defects. The membrane shall conform to the following requirements:

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>60&quot; 5 mils</td>
</tr>
<tr>
<td>Pliability 180/ bend over 1&quot; mandrel at 10 /F</td>
<td>No Cracks</td>
</tr>
<tr>
<td>Softening Point</td>
<td>240 /F Minimum</td>
</tr>
<tr>
<td>Needle Penetration 5 sec. at 100g</td>
<td>40 to 50 at 77 /F</td>
</tr>
<tr>
<td>Weight per square yard</td>
<td>2.6 to 3.2 lbs.</td>
</tr>
</tbody>
</table>

4. **System D:**

a. **Membrane** - The membrane shall be a liquid elastomeric membrane conforming to the following requirements:

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penetration</td>
<td>1.20 cm max., after 48 hours</td>
</tr>
<tr>
<td>Flow</td>
<td>No Flow, 72 hrs. at 158 /F</td>
</tr>
<tr>
<td>Bond</td>
<td>3&quot; Separation, 3 cycles, 0 /F</td>
</tr>
<tr>
<td>Resilience</td>
<td>60 Min., after 48 hrs. temperature 77 /F</td>
</tr>
<tr>
<td>Elongation</td>
<td>500% Min. 2&quot; per minute at 77 /F</td>
</tr>
<tr>
<td>Pliability</td>
<td>No cracks when slowly bent at 10 /F over a 1&quot; mandrel</td>
</tr>
</tbody>
</table>
b. **Protective Covering** - The protective covering shall be Type II Asphalt Roll Roofing conforming at ASTM D224, except that it shall be manufactured without talc, mica or dust on one side. Minor amounts of talc, mica or dust deposited due to rolling for shipment will not be cause for rejection.

5. **System E:**

   a. **Primer** - The surface conditioner shall be a cut-back type solvent conforming to ASTM D41, mixed in a ratio of one part primer to three parts white gasoline.

   b. **Membrane** - The waterproof membrane shall be a single component, hot-applied, clay extended rubberized asphalt which, after cooling, shall form a monolithic flexible surface averaging c inch (125 mils) in thickness continuously bonded to the concrete substrate and shall conform to the following requirements:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Standard</th>
</tr>
</thead>
</table>
   | Penetration               | 35 cm Max at 32 °F  
                             | 100 cm Max at 77 °F  
                             | 220 cm Max at 120 °F  | ASTM D1191 |
   | Flow                      | Note at 120 °F .5 cm Max at 140 °F               | ASTM D1191     |
   | Water Vapor Transmission  | .016 gr. at 120 °F                             | ASTM E96       |
   | Water Resistance          | No blistering  
                             | No emulsification  
                             | No deterioration  | ASTM D2939  |
   | Low Temperature Flexibility and Adhesion | No delamination, cracking or adhesion failure | Bend 125 mil thick membrane on aluminum 90 /over 3” mandrel at -15 °F |
   | Toughness-Tenacity (Elasticity) | 22 in./lbs./min/ | Reaction to sudden elongation 20 in./min. |

   c. **Protective Covering** - The protective coating shall be 55 lb. asphalt roll roofing without talc, mica or dust on one side conforming to ASTM D224, Type II, except provisions pertaining to roofing applications are waived. The sheets shall be free from visible external defects such as holes, ragged or untrue edges, breaks, protuberances or indentations.

**SECTION 223—STEEL REINFORCEMENT**

223.02 – **Detail Requirements** *is amended with the following*

   (e) **Corrosion Resistant Reinforcing Steel, Class I** *replaces with the following paragraph*

(f) Corrosion Resistant Reinforcing Steel, Class II - replaces with the following paragraph


(g) Corrosion Resistant Reinforcing Steel, Class III - replaces with the following paragraph


SECTION 232 - PIPE AND PIPE ARCHES

232.02 - Detail Requirements - is amended as follow:

(c) Steel Pipes: - is amended as follow

1. Corrugated steel culvert and pipe arches – delete the paragraphs
2. Corrugated steel pipe – delete the paragraph
7. Concrete-lined corrugated steel pipe arches – delete the paragraphs
8. Polymer coated steel pipe – delete the paragraph
9. Corrugated steel double wall pipe – delete the paragraph

d) Structural Plate Pipe, Pipe Arches and Arches: - delete the paragraph
(e) Aluminum Alloy Pipes: - delete the paragraphs
(g) Glass Fiber-Reinforced Epoxy Pipe and Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipe and Fittings: - delete the paragraph
(i) Polyethylene (PE) Pipe: - delete the paragraph
SECTION 238 - ELECTRICAL AND SIGNAL COMPONENTS

238.02 - Detail Requirements – is amended as follows

(f) Electrical and Signal Junction Boxes: - replaces third paragraph with the following

All junction boxes shall be on VDOT’s preapproved list.

(f) Electrical and Signal Junction Boxes: - add the following

Junction box covers shall be labeled “Traffic”, and shall be “non-skid”.

All junction boxes shall have rubber gaskets and “J” hooks.

Junction box covers shall have lift pins.

Junction boxes shall come with 20K lids.

(f) Electrical and Signal Junction Boxes: - is amended as follows

Junction Boxes for off roadway application – replaces second paragraph with the following

Boxes shall be polymer concrete with flared fiberglass sides and smooth walls.

(g) Conductor Cables:

2. Communication and signal cables: – is amended as follows

a. Signal cable from the controller cabinet to the signal heads - replaces with the following paragraph

Signal cable from the controller cabinet to the signal heads shall be No. 14 AWG stranded copper with 3, 4, 5, or 7 straight-lay conductors.

b. Interconnect cables between controllers – replaces with the following

Interconnect cables between controllers shall be twisted pair 19 AWG solid copper conforming to REA Specification PE-39 (duct and direct burial); or REA Specification PE-38 (self-supporting aerial). Interconnect cable drops between the traffic signal controller cabinet and aerial or above ground terminal enclosures shall conform to REA Specification PE-39.

c. Loop detector cables – replaces with the following paragraph

Loop detector cables shall be No. 12 AWG stranded copper conforming to the requirements of IMSA 51-3. Insulation shall be Type XHHW. Loop detector cable enclosed in tubing shall be No. 12 AWG stranded copper. The loop detector cable and casing shall conform to IMSA 51-5.
e. **Microwave detector lead in cable** - *add the following paragraph*

**Microwave detector lead in cables** shall be No. 18 AWG copper with five (5) straight-lay conductors conforming to the requirements of IMSA 19-1 or 20-1 and shall be used for connection of the detectors to the step down transformers and to the detector panel.

(h) **Electrical Components:** - *is amended as follow*

1. **Safety switches** – *replaces with the following paragraph*

**Safety switches** shall be enclosed in a rain-tight box conforming to the requirements of NEMA 3R. For signal installations, safety switches shall include a minimum of one single pole, 120-volt AC circuit breaker. The circuit breaker shall have an ampere rating compatible with the equipment load (50 AMP minimum unless otherwise specified).

6. **Signal heads sections:** - *is amended as follow*

a. **Vehicle traffic signal head sections** – *replace with the following paragraphs*

   (1) ITE Vehicles Traffic Control Signal Heads-Light Emitting Diode Circular Signal Supplemental dated June 27, 2005 for signal head sections containing circular signal indications with the exception of using green clear lens for green circular indications; or

   (2) ITE Vehicles Traffic Control Signal Heads-Light Emitting Diode Arrow Signal Supplemental dated July 1, 2007 for signal head sections containing arrow signal indications with the exception of using green clear lens for green arrow indications.

a. **Vehicle traffic signal head sections** – *add the following paragraphs*

   (3) Visors shall be secured to the door with stainless steel hardware.

   (4) The door of each section shall be secured to the housing with two stainless steel eye bolts and wing nuts. Hinge pins shall be stainless steel.

   (5) Each three section traffic signal head shall have a four position terminal block located in the center section. Four section signal heads shall have a six position terminal block located in the second section from the top. Five section dog house span mount shall have six position terminal block located in red section and minimum four position terminal block in yellow ball and yellow arrow sections. Five section dog house rigid mount (mast arm) shall have six
position terminal block in yellow ball section and a minimum four position terminal block in yellow arrow section and red section.

(6) Signal head section housing, door and visor shall be made of nonferrous metal.

b. **Pedestrian signal head sections** – *add the following to the first paragraph*

Pedestrian signal head sections shall be made of nonferrous metal.

c. **LED vehicle traffic control and pedestrian signal modules** – *replaces the first paragraph with the following*

LED vehicle traffic control and pedestrian signal modules shall be tested in accordance with the applicable ITE Specifications. The Contractor shall provide the LED manufacturer’s certificate of ITE compliance for the applicable module(s) furnished and independent laboratory test reports. Independent laboratory tests shall include specific test and test results of each test as specified in the ITE Design Qualification Testing Sections of the ITE Standards for both vehicle control signal and pedestrian modules. Independent test reports shall be submitted at the same time as the catalog cut is submitted for the model and type incandescent look LED signal module furnished.

c. **LED vehicle traffic control and pedestrian signal modules** – *replaces the third paragraph with the following*

LED traffic signal modules shall be warranted by the manufacturer for 7 years from the date of manufacture against manufacturing defects and workmanship. The Contractor shall be responsible for the replacement and installation costs if the module fails due to material and/or workmanship defects during this 7-year period.

7. **Backplates for signal heads:** – *replace with the following*

a. **Standards Signal Backplate** (non-reflective) shall be aluminum. ABS plastic and aluminum composite shall not be used for a backplate.

Aluminum shall be at least 0.06” but not more than 0.08” thick, and be smooth, flat, and free of metal burrs and splinters. Aluminum alloy shall conform to Section 229 of the Specifications. Standard aluminum signal backplates shall be entirely powder coated black in accordance with manufacturer’s instructions.

b. **High-Visibility Signal Backplate (HVSB)** shall be aluminum; ABS plastic or aluminum composite shall not be used. HVSBs shall be preassembled by the manufacturer with a 3” retro reflective fluorescent yellow border on the outside of the front of the backplate.
All retro reflective sheeting on the front surface of the backplate shall be ASTM D4956-13, Type XI fluorescent yellow from the VDOT Materials Division Approved Product List 46 for permanent signs. Sheeting shall be warranted in accordance with Section 247.03.

Retroreflective sheeting shall be applied to the backplate with a zero-degree orientation (downweb direction perpendicular to the road) and adhered to the backplate in accordance with the retroreflective sheeting manufacturer’s instructions. Retroreflective sheeting shall be butt spliced when more than one piece of sheeting is adhered to the backplate. For each surface of the backplate, a maximum of five butt splices shall be used for three-section and four-section signal heads, and a maximum of nine butt splices shall be used for five-section signal heads.

**Aluminum** shall be at least 0.06” but not more than 0.08” thick, and be smooth, flat, and free of metal burrs and splinters. Aluminum alloy shall conform to Section 229 of the Specifications. The front surface of the HVSB shall be entirely covered with the retroreflective sheeting specified above, then black color shall be applied to the front surface except for the outer 3” of the front of the backplate which shall remain fluorescent yellow. The black color on the front surface of the backplate shall be obtained by screen printing or applying acrylic film. Black color on the back surface of the backplate shall be obtained by applying acrylic film to the aluminum or by screen printing on sheeting applied to the aluminum. Aluminum preparation and application of sheeting and film shall be in accordance with the sheeting manufacturer’s instructions.

23. **Splice kits** – replaces with the following paragraph

Splice kits shall consist of heavy-wall heat shrinkable tubing or wraparound sleeves designed specifically for insulating spliced communications and electrical cables in direct buried and wet environments. Prepackaged waterproof type splice kits shall consist of a plastic molded body with an insulating compound that completely encloses the splice. Prepackaged splice kits used for vehicle loop detectors shall be re-enterable. Splice kits shall insulate and moisture-seal multi-conductor cables through 1000 volts.

30. **Above ground cable terminal enclosures** – add the following paragraph

Above ground cable terminal enclosures shall be constructed of 14 gauge galvanized steel.

31. **Terminal Blocks for interconnect cable** – add the following paragraph

Terminal Blocks for interconnect cable shall be specifically designed for use in above ground terminal enclosures and shall have bright-acid tin plated posts, nuts and washers. Terminal blocks suitable for terminating 25 pair interconnect cable shall be furnished unless otherwise specified on the plans.
SECTION 242 - FENCES

242.02 – Detail Requirements

(c) Temporary Silt Fences, Geotextile Fabric, and Silt Barriers: is amended as follows

2. Posts for temporary silt fences – replaces with the following paragraph

Posts for temporary silt fences shall be a nominal 2” by 2” oak, or steel having a weight of at least 1.25 pounds per linear foot.

SECTION 244 - ROADSIDE DEVELOPMENT MATERIALS

244.02 - Detail Requirements

(b) Topsoil: is amended as follows

1. Class A topsoil: - add the following paragraphs

   It shall be free from refuse or any material toxic to plant growth and reasonably free from subsoil, stumps, roots, brush, stones, clay lumps or similar objects larger than 3” in their greatest dimension. Any stockpiled topsoil shall meet or exceed all of the specifications for Class B topsoil. A soil test report, described in 244.02 (b) - 4, shall be provided to the Owner by the Contractor for any stockpiled topsoil to be used. Required soil amendments for lawn establishment, as indicated on the soil test report, shall be added by the Contractor at the time of spreading/grading.

2. Class B topsoil: - add the following paragraphs

   The Contractor shall furnish, at his expense, sufficient topsoil to properly perform all work as specified herein, and as shown on the drawings. Topsoil furnished shall be a natural, fertile, friable loam soil, possessing characteristics of representative of productive soils in the vicinity. It shall be obtained from naturally well-drained areas. It shall not contain toxic substances that may be harmful to plant growth. Topsoil shall be without admixture of subsoil and shall be cleaned and reasonably free from clay, lumps, stones, stumps, roots or similar substances 2” or more in diameter, debris, or other objects which might be a hindrance to planting operations.

   Topsoil shall contain at least six percent organic matter. The acidity range shall be between 5.5 and 7.0 inclusive. The mechanical analysis of the soil, which shall be based on either sieve size or USDA Particle Size Designation, shall be as follows:
Sieve Size | Percent Passing
--- | ---
1” mesh | 99-100 percent
¼” mesh | 97-99 percent
No. 100 mesh | 40-60 percent
No. 200 mesh | 20-40 percent

| Particle Distribution of Imported Topsoil (USDA Designation) |
|---|---|
| Gravel | Less than 10% |
| Coarse To Medium Sand | 30 to 65% |
| Fine Sand | 5 to 20% |
| Very Fine Sand | 0 to 20% |
| Silt | 15 to 25% |
| Clay | 10 to 25% |

A representative sample of topsoil shall be delivered to the Owner or his designee within ten days of award of contract and before work begins. A soil test report, which is described in 244.02 (b) - 4 may be required at the discretion of the Owner. Required soil amendments for lawn establishment, as indicated on the soil test report, shall be added by the Contractor at the time of spreading/grading.

3. **Testing and documentation:** - replaces with the following paragraph

**Testing and documentation:** shall be furnished by the Contractor and shall have a pH in the range of 5.5 to 7.0 prior to mixing with the organic matter. If the pH is not within the range, the pH shall be corrected at the Contractor’s expense or a different source of supply shall be selected. A representative sample of topsoil shall be delivered to the Owner or his designee within ten days of award of contract and before work begins. A soil test report, which is described in 244.02 (b) - 4 may be required at the discretion of the Owner. Required soil amendments for planting plants, as indicated on the soil test report, shall be added by the Contractor at the time of planting.

4. **Soil Testing:** - add the following paragraph

**Soil Testing:** The Owner, or his designee, shall have the option to inspect topsoil intended for use by the Contractor in completion of the work to determine whether
it is in accordance with plans and specifications. At the discretion of the Owner, a soil test analysis report may be required for each stockpile of existing topsoil, or source of imported topsoil and/or planting mix. This test shall be performed at no cost to the Owner. The soil testing laboratory shall be approved by the Owner, and there shall be no cost to the Owner for any requested testing. Material or materials that are not in accordance with plans and specifications shall be replaced with approved material or materials at no additional cost to the Owner. If required, the soil test analysis report shall include the following information:

a. **Particle analysis** shall be based on the following sieve size chart or the following USDA gradient of mineral content:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>USDA Designation</th>
<th>Size in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 inch mesh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>¼ inch mesh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 100 mesh</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 200 mesh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

USDA Designation: Gravel 2+ mm, Very Coarse Sand 1-2 mm, Coarse Sand 0.5-1 mm, Medium Sand 0.25-0.5 mm, Fine Sand 0.1-0.25 mm, Very Fine Sand 0.05-0.1 mm, Silt 0.002-0.05 mm, Clay Smaller than 0.002 mm.

b. **Chemical analysis** shall include the following:

pH and buffer pH.

Percentage of organic content by oven-dried weight.

Nutrient levels in parts per million (ppm), including phosphorous, potassium, magnesium, iron, zinc, and calcium. Nutrient test shall include the testing laboratory’s recommendations for supplemental additions to the soil based on the requirements of horticultural plants.

Soluble salts by electrical conductivity of a 1:2 soil: water sample measured in mmhos/cm.

Cation exchange capacity (CEC).

(c) **Seeds**:  - replaces the first paragraph with the following

(c) **Seeds**: Kinds and varieties of seeds shall be delivered to the project in separate sacks
bearing a green seed label denoting the seed has been inspected and approved by the Virginia Crop Improvement Association. Seeds shall be mixed under the observation of the Owner on the project or at other approved locations. Seeds shall comply with applicable state and federal seed laws and contract requirements. Seed shall not be used until approved by the Owner.

(c) **Seeds:** *replaces the third paragraph with the following*

Seed test shall be completed within the nine month period prior to the beginning of the “area” scheduled seeding period during which the seed is to be used.

(d) **Fertilizers:** *is amended as follow*

1. **Fertilizer for seeding, sodding, springing and plugging** *add the following paragraphs*

   a. **Starter Fertilizer:** Initial fertilizer for seeding and sodding shall be a granular, non-burning turfgrass fertilizer with an N:P₂O₅:K₂O analysis ratio of 1:2:1, or equivalent and may only be used if the soil test shows to be below the very high scale, and only to the amount required, not to exceed 1 pound of phosphorus in a 30 day increment. Fertilizer shall be uniform in composition, free-flowing, and suitable for application with approved equipment. Fertilizer shall be delivered to the site in original, unopened containers, each bearing the manufacturer's guaranteed analysis label. At least 25% of available nitrogen shall be in a slow-release form if using a 0.5 pounds per 1000 ft² in 15 day intervals or if a 50% or more slow release nitrogen is used a 1 pound per 1000 ft² nitrogen fertilizer can be used in increments of 30 days not to exceed 4 pounds per year.

   b. **Maintenance Fertilizer:** Fertilizer for all applications other than the initial fertilization shall be a granular, non-burning turfgrass fertilizer with an N:P₂O₅:K₂O analysis ratio of 3:0:2 or 4:0:2, or equivalent. P₂O₅ shall only be applied as indicated by soil test results. All fertilizer used and time intervals may refer to paragraph ‘Starter Fertilizer’, above. Fertilizer shall be uniform in composition, free flowing, and suitable for application with mechanized rotary spreaders, drop spreaders, hydraulic seeders, or other equipment capable of uniformly distributing fertilizer over the soil surface. Fertilizer shall be delivered to the site in original, unopened containers, each bearing the manufacturer's guaranteed analysis label. At least 25% of available nitrogen shall be in a slow-release form.

3. **Fertilizers for wetland mitigation planting** *add the following paragraph*

   **Fertilizers for wetland mitigation planting** shall be Osmocote, slow release fertilizer with an analysis of 14-14-14 or equal, and Agroform slow release tablet fertilizer with an analysis of approximately 20-20-20, or equal. Fertilizer shall be delivered to the project in bags or other convenient containers, each fully labeled, and shall conform to the applicable state and federal regulations.

(k) **Miscellaneous Planting Materials:** *is amended as follow*
10. **Manure** – *add the following paragraph*

Manure shall be used to modify topsoil for wetland mitigation planting. Manure shall be well rotted stable manure free from sticks, stones, mineral matter, or other foreign material.

244.02 - **Detail Requirements** – *is amended as follows*

1. **Rolled Erosion Control Products:** *replaces with the following paragraphs*

   (l) **Rolled Erosion Control Products:**

   1. **Rolled Erosion Control Products (Standard EC-2)** shall conform to Table II-22C and the following requirements. EC-2 products shall be designed for use on geotechnically stable slopes and channels as detailed herein.

   a. **EC-2, Type 1** shall be a relative short-term single-net erosion control blanket or open weave textile. EC-2, Type 1 shall be one of the following materials: (1) an erosion control blanket composed of processed degradable natural or polymer fibers mechanically-bound together by a single degradable synthetic or natural fiber netting to form a continuous matrix; or (2) an open weave textile composed of processed degradable natural or polymer yarns or twines woven into a continuous matrix. EC-2, Type 1 shall typically have a 12-month functional longevity from the date of installation, be designed for use on up to 1V:3H slopes and channels, with shear stresses up to 1.50 pounds per square foot.

   b. **EC-2, Type 2** shall be a relative short-term double-net erosion control blanket. The blanket shall be composed of processed natural or polymer fibers mechanically bound between two natural fibers to form a continuous matrix. EC-2, Type 2 materials shall typically have a 12-month functional longevity from the date of installation, be designed for use on up to 1V:2H slopes and channels, with shear stresses up to 1.75 pounds per square foot.

   c. **EC-2, Type 3** shall be an extended term erosion control blanket or open weave textile. EC-2, Type 3 blankets shall be one of the following materials: 1) an erosion control blanket composed of processed slow degrading natural or polymer fibers mechanically-bound together between two slow degrading synthetic or natural fiber nettings to form a continuous matrix; or 2) an open weave textile composed of processed slow degrading natural or polymer yarns or twines woven into a continuous matrix. EC-2, Type 3 material shall typically have a 24-month functional longevity from the date of installation, be designed for use on slopes up to 1V:1.5H and channels, with shear stresses up to 2.00 pounds per square foot.

   d. **EC-2 Type 4** shall be a long-term erosion control blanket or open weave textile. EC-2, Type 4 blankets shall be one of the following materials: (1) an erosion control blanket composed of processed slow degrading natural or polymer fibers mechanically-bound together between two slow
degrading synthetic or natural fiber nettings to form a continuous matrix; or (2) an open weave textile composed of processed slow degrading natural or polymer yarns or twines woven into a continuous matrix. EC-2, Type 4 material shall typically have a 36-month functional longevity from the date of installation, be designed for use on up to 1V:1H slopes and channels, with shear stresses up to 2.25 pounds per square foot.

2. **Permanent Rolled Erosion Control Products (Standard EC-3)** shall be permanent turf reinforcement mats conforming to Table II-22D and the following.

   a. **EC-3, Type 1** shall be a non-degradable mat of sufficient thickness, strength and void space for permanent erosion protection and vegetation reinforcement on geotechnically stable slopes with gradients up to 1V:1.5H, channels with design shear stresses up to 6.0 pounds per square foot, and on other areas where design flow conditions exceed the limits of sustainability for mature natural vegetation.

   b. **EC-3, Type 2** shall be a non-degradable mat with sufficient thickness, strength and void space for permanent erosion protection and vegetation reinforcement on geotechnically stable slopes with gradients up to 1V:1H, channels with design shear stresses up to 8.0 pounds per square foot, and other areas where design flow conditions exceed the limits of sustainability for mature natural vegetation.

   c. **EC-3, Type 3** shall be a non-degradable mat with sufficient thickness, strength and void space for permanent erosion protection and vegetation reinforcement for use on geotechnically stable slopes up to 1V:0.5H, channels with design shear stresses up to 10.0 pounds per square foot, and other areas where design flow conditions exceed the limits of sustainability for mature natural vegetation.

**SECTION 245 – GEOSYNTHETICS AND LOW PERMEABILITY LINERS**

**245.03 – Testing and Documentation - replaces the third paragraph with the following**

Property values in these specifications represent minimum average roll values (MARV) in the weakest principal direction unless direction is otherwise specified; permittivity values specified are minimum; AOS and panel vertical strain values are maximum; mass per unit area, UV degradation, and asphalt retention values are typical.

(e) **Prefabricated Geocomposite Pavement Underdrain: is amended as follow**

2. **Filter Fabric: - add the following paragraphs**

   Drainage fabric shall be suitable for subsurface application and be stable both thermally and biologically. Drainage fabric shall be bonded to or stretched tightly over the core, and shall not sag nor block the flow channels. Drainage fabric shall conform to the following:
The drainage fabric shall retain at least 75 percent of its ultimate strength when subjected to a pH of a minimum 3 and a maximum 12 for a period of 24 hours.

(f) **Geocomposite Wall Drains:** replaces with the following paragraphs

**Geocomposite Wall Drains:** Prefabricated geocomposite wall drain shall consist of a polymeric drainage core encased in a nonwoven filter fabric envelope having sufficient flexibility to withstand bending and handling without damage. Geocomposite wall drains shall conform to the following:

1. **Core:** The drainage core shall be made from an inert, polymeric material resistant to commonly encountered chemicals and substances in the roadway. Outer surfaces shall be smooth to prevent excessive wear of bonded filter fabric


<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Test Methods</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent opening size (AOS)</td>
<td>ASTM D4751</td>
<td>&gt; 0.300 mm</td>
</tr>
<tr>
<td>Tensile strength @ Elongation &gt;</td>
<td>ASTM D4632</td>
<td>110 Lbs. (min)</td>
</tr>
<tr>
<td>Permittivity</td>
<td>ASTM D4491</td>
<td>0.5 Sec^{-1} (min)</td>
</tr>
</tbody>
</table>

2. **Filter Fabric:** Geotextile shall be bonded to and tightly stretched over both sides of the core. Geotextile shall not sag or block the flow channels, shall have a life equivalent to that of the core material, and shall conform to the requirements of (c) herein, except that grab strength requirement shall meet AASHTO M288 Table 1, Class 2.

245.03 – **Testing and Documentation** – is amended as follow

(k) **Fabric for Use in Turbidity Curtains** – add the following

(k) **Fabric for Use in Turbidity Curtains:** This fabric shall consist of synthetic fabric coated with suitable elastomeric or polymeric compound. The coating shall have a high resistance to weathering, hydrocarbons, fresh and salt water, and temperature extremes. The curtain shall form a continuous vertical and horizontal barrier for the entire width and length of each section. Seams, if required, shall be either vulcanized welded or sewn and shall develop the full strength of the fabric.
The curtain fabric shall meet the minimum requirements noted below:

<table>
<thead>
<tr>
<th>Physical Properties of Turbidity Curtain Fabric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Property</td>
</tr>
<tr>
<td>Weight (oz./yd²)</td>
</tr>
<tr>
<td>Type I</td>
</tr>
<tr>
<td>Type II</td>
</tr>
<tr>
<td>Type III</td>
</tr>
<tr>
<td>Grab Tensile Strength (ASTM D 4632)</td>
</tr>
<tr>
<td>UV Inhibitor</td>
</tr>
</tbody>
</table>

SECTION 246 - PAVEMENT MARKINGS

246.03 – Pavement Marking Materials – *is amended as follow*

(b) Thermoplastic Pavement Marking Material (Type B, Class I): - *replace the first and second sentence in the second paragraph with the following*

The binder shall be lead-free alkyd. The binder shall consist of synthetic resins, at least one of which is solid at room temperature, and high boiling plasticizers.

(c) Preformed Thermoplastic Pavement Marking Material (Type B, Class II): - *add the following paragraph*

The material shall be resistant to deterioration due to exposure to sunlight, water, salt, or adverse weather conditions and impervious to oil and gasoline.

SECTION 247 - REFLECTIVE SHEETING

247.02 – Details Requirements – *add the following paragraph*

The retro reflective sheeting will have a smooth surface and orientation marks visible from the face. Letters, numerals, arrows, symbols, borders, and other features of the sign message will conform to the requirements of the plans by a removable liner. Signs with black letters on orange backgrounds will have the letter stroke width increased approximately 15% for Series B, C, and D letter widths. The widening of the stroke will be to the inside of the letter. In addition, the space from the top and bottom borders or from the vertical borders should be equal to the uppercase letter height. The space between lines of copy should be equivalent to the uppercase letter height used in adjacent lines of copy.

(a) **Type IX sheeting used for following applications** – *add the following paragraphs*

3. **Permanent Signs** - Reflective sheeting used on permanent regulatory, warning, guide and other signs as directed by the owner will be fabricated with Visual Impact Performance (VIP) prismatic lens type retroreflective sheeting, 3M Series #3990 or approved equal, unless otherwise approved or specified on the plans.
4. **Street Name Signs** - Unless otherwise approved or specified on the plans, reflective sheeting used on street name signs shall be fabricated as follow:

Signs will be covered with a background of #4090 white 3M VIP Prismatic Grade Reflective Sheeting (or approved equal), lettering shall be capital and lower case series C or D, cut from green #1177 3M Electronic Cuttable Film in a reverse method.

Letters, numbers, arrows, symbols, borders, and other features of the sign message shall conform to the requirements of the current MUTCD unless otherwise stated in the specifications.

5. **Physical Requirements** - Coefficient of Retroreflection, R<sub>A</sub>, will not be less than the minimum values specified in Table II-24. Testing will be in accordance with ASTM E 810.

<table>
<thead>
<tr>
<th>Observation Angle (°)</th>
<th>Entrance Angle (°)</th>
<th>White</th>
<th>Yellow</th>
<th>Green</th>
<th>Blue</th>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>-4</td>
<td>650</td>
<td>600</td>
<td>90</td>
<td>45</td>
<td>180</td>
</tr>
<tr>
<td>0.2</td>
<td>-4</td>
<td>430</td>
<td>350</td>
<td>50</td>
<td>25</td>
<td>115</td>
</tr>
<tr>
<td>0.5</td>
<td>-4</td>
<td>250</td>
<td>200</td>
<td>30</td>
<td>15</td>
<td>65</td>
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<tr>
<td>1.0</td>
<td>-4</td>
<td>90</td>
<td>70</td>
<td>10</td>
<td>5</td>
<td>24</td>
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</table>

<table>
<thead>
<tr>
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<th>Yellow</th>
<th>Green</th>
<th>Blue</th>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>30</td>
<td>525</td>
<td>380</td>
<td>55</td>
<td>25</td>
</tr>
<tr>
<td>0.2</td>
<td>30</td>
<td>250</td>
<td>200</td>
<td>30</td>
<td>15</td>
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<tr>
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<td>30</td>
<td>170</td>
<td>140</td>
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<td>10</td>
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<td>3.5</td>
<td>3.5</td>
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</table>

<table>
<thead>
<tr>
<th>Observation Angle (°)</th>
<th>White</th>
<th>Yellow</th>
<th>Green</th>
<th>Blue</th>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>45 *</td>
<td>200</td>
<td>160</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>0.2</td>
<td>45 *</td>
<td>150</td>
<td>120</td>
<td>16</td>
<td>7.5</td>
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<tr>
<td>0.5</td>
<td>45 *</td>
<td>60</td>
<td>45</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>1.0</td>
<td>45 *</td>
<td>15</td>
<td>13</td>
<td>2.4</td>
<td>1.1</td>
</tr>
</tbody>
</table>

* Denotes 90° Rotation Angle
Reflective sheeting used on brown colored signs shall be encapsulated lens type conforming to the reflectivity for a Type III glass bead retroreflective material and the following supplementary tables:

<table>
<thead>
<tr>
<th>Observation Angle (°)</th>
<th>Entrance Angle (°)</th>
<th>Brown</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>-4</td>
<td>12.0</td>
</tr>
<tr>
<td>0.2</td>
<td>+30</td>
<td>8.5</td>
</tr>
<tr>
<td>0.5</td>
<td>-4</td>
<td>5.0</td>
</tr>
<tr>
<td>0.5</td>
<td>+30</td>
<td>3.5</td>
</tr>
</tbody>
</table>

In addition, brown sheeting shall conform to the following color requirements:

<table>
<thead>
<tr>
<th>Color</th>
<th>Reflectance Limits Y (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Brown</td>
<td>0.430</td>
</tr>
</tbody>
</table>

(d) **White and Fluorescent Orange Type IX reflective sheeting** – *add the following paragraph*

**Aluminum Sign Panels** - will be fabricated with wide angle fluorescent orange prismatic lens type retroreflective sheeting, 3M Series #3924F or 4084G or approved equal. The prismatic lens will be formed in a transparent fluorescent synthetic resin, sealed, and backed with a pressure sensitive adhesive protected by a removable liner. The use of aluminum sign panels is restricted and must comply with NCHRP Report 350.

(g) **Reflective sheeting used on Retroreflective Rollup Signs (used for temporary construction, maintenance, permit, utility and incident management activities)** – *replaces the second paragraph with the following*

**Roll Up Signs Panels** - will be fabricated with wide angle fluorescent orange prismatic lens type retroreflective sheeting 3M Series #RS24 or approved equal. The prismatic lens will be formed in a transparent fluorescent synthetic resin, sealed, and backed with a strong, flexible gray coated fabric made from a denier polyester, without PVC components.

**SECTION 253 – DETECTABLE WARNING SURFACE** – *add the following section*

253.01 – **Description** – *add the following paragraph*
These specifications cover the truncated domes tile material used on curb ramps in compliance with applicable Americans with Disabilities Act Accessibility (ADAAG) and American with Disabilities Act (ADA) regulations with regard to detectable warning surfaces. The color and width of the detectable warning surfaces shall be as specified in the Contract.

253.02 – Materials – add the following paragraphs

Detectable Warning Surface shall be “tiles” made of homogeneous glass and carbon, reinforced composite material or vitrified polymer composite (VPC) material with ultraviolet stabilized coating, to minimize color wear, and a “non-slip” surface, incorporating “truncated domes,” made of same material. The nominal thickness of the detectable warning tile shall be 1/8” exclusive of the height of the truncated domes.

Detectable warning surface shall be Cast-In Place tile. Cast-In-Place tile shall be installed in the concrete in accordance with manufacturer’s specifications. The cast-in-place tile shall be used for new construction.

(a) Detail Requirements: Requirements for the detectable warning surface tiles shall meet the following:

1. Compressive Strength: 18,000 PSI minimum when tested by ASTM D695
2. Tensile Strength: 10,000 PSI minimum when tested by ASTM D638-91
3. Flexural Strength: 24,000 PSI minimum when tested by ASTM C293-94 or ASTM D790
4. Water Absorption: 0.35% maximum when tested by ASTM D570
5. Slip Resistance: 0.9 minimum for the combined wet/dry static co-efficient of friction when tested by ASTM C1028
6. Chemical and Stain Resistance: No deterioration, discoloration or staining when tested by ASTM D543-87 or ASTM 1308
7. Fire Resistance: 25 minimum when tested to ASTM E84
8. Accelerated Weathering: No deterioration, fading or chalking of surface after 2000 hours minimum exposure when tested by ASTM G26-95
9. Salt and Spray Performance: No deterioration or other detects after 100 hours minimum exposure when tested by ASTM B117
10. Accelerated Aging and Freeze Thaw: No disintegration, cracking, delamination, warpage, blistering, color change or other defects when tested by ASTM D037 or ASTM C1026

(b) Pattern/Dimension: Pattern and dimensions of the detectable warning surface tile shall incorporate an “in-line” dome pattern of truncated domes 0.2” in height, 0.9” diameter at the base and 0.4” diameter at top of dome. Domes should be spaced no greater than 2 ¾” from center to center. The field area of the detectable warning surface should consist of raised points no greater than 0.045”, to create a non-slip surface for wheelchair safety. Surface mounted detectable warning surface tiles shall have countersunk fastening holes and perimeter beveled edges. Overall dimension of the detectable warning surface tiles shall be in accordance with this specification and the contract documents.

(c) Color: Unless otherwise called out in the contract documents, the detectable warning surface tiles shall be “Brick Red”, Federal Color No. 31136, or Federal Color No.11302, for applications on standard concrete curb ramps and “Light Gray”, Federal Color No.
26280 for applications on red brick paver or red brick concrete paver ramps, or as approved by Owner. The color shall be integral with the detectable warning device tiles and shall not be surface applied. Paints or other surface coatings shall not be used. Product samples with proposed color shall be submitted to Owner for approval prior to installation.

(d) **Manufacturer:** Detectable Warning Surface tile shall be provided by:

1. Engineered Plastics, Inc. (Armor-Tile)
2. ADA Solutions, Inc.
3. Approved Equal

(e) **Fasteners:** Fasteners shall be flat-head drive anchors made of a corrosion-resistant material ¼” in diameter x 1 ¾” long.

(f) **Adhesives:** Adhesive shall be a urethane elastomeric adhesive material, as required by the manufacturer’s specifications.

(g) **Sealants:** Sealant shall be a gray epoxy, two-component sealant, as required by the manufacturer’s specifications.
DIVISION III

ROADWAY CONSTRUCTION
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<td>Section 317 - Stone Matrix Asphalt Concrete Placement</td>
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</table>
 SECTION 302 - DRAINAGE STRUCTURES

302.02 - Materials – *is amended as follow*

(a) **Pipe** – *add the following*

When used within the travel ways, only 4000 psi reinforced concrete pipe or concrete box culvert shall be used for drainage.

302.02 - Materials – *add the following paragraphs*

(n) **Flowable backfill** shall conform to Section 249

(o) **Select borrow for trench backfill** shall meet the requirements of Section 303 - Earthwork.

302.03 - Procedures – *add the following to the first paragraph*

The Contractor shall use trench support and excavation methods that ensure the protection of existing utilities in accordance with Section 105.07 and the maintenance and protection of traffic in accordance with Section 104.04 and Section 107.07.

The Contractor shall submit to the Owner a complete plan and schedule for pipe installation prior to the commencement of such work. The submission shall include complete details of the sheeting, shoring and bracing for the protection of the roadbed and any adjacent utilities and any adjacent structures. The Contractor shall not proceed with the pipe installation until he has received acceptance of the plan and schedule from the Owner. The Owner's acceptance does not release the Contractor from responsibility for adequacy of design of all sheeting used on this project.

302.03 - Procedures

(a) **Pipe Culverts:**

2. **Open trench method:** - *is amended as follow*

   d. **Joining pipe:** - *replaces with the following paragraphs*

   **Joining pipe:** The inspector will verify the correct joint materials are used and installed correctly.

   (1) **Rigid pipe:** The Contractor’s method of joining pipe sections shall be such that the sections are aligned and firmly joined to form the joint as specified on the plans. The joint type shall be installed as specified on the plans, in the event the joint is not specified, it shall be a leak-resistant joint

   (2) **Flexible pipe:** Flexible pipe sections shall be aligned and firmly joined to form the joint as specified on the plans. In the event the joint is not specified, it shall be a leak-resistant joint.
g. **Backfilling:** – *add the following paragraphs*

Backfill material for utility construction (water and sanitary sewer) shall conform to Section 520.

Select borrow for trench backfill shall be furnished for backfilling to the full width of the trench. It shall be measured in cubic yards in place, except that the quantity for which payment will be made shall not exceed the volume of the trench as computed by using the maximum width of trench permitted by the specifications (PB-1) and the actual depth of the completed trench backfill above the center of the pipe, with a deduction for the volume of one-half of the pipe. Any trench backfill required in excess of the maximum quantity herein specified shall be furnished by the Contractor at his expense.

Any material meeting the requirements of Section 303, Select Borrow - CBR 15, which has been excavated from the trenches shall be used for backfilling the trenches. However, no compensation shall be allowed for Select Borrow for Trench Backfill for the portion of the trench backfilled with excavated material, obtained onsite.

Select borrow for trench backfill shall not be used until all suitable excavation obtained from the project limits has been utilized, unless otherwise authorized by the Owner.

(a) **Pipe Culverts:** - *is amended as follow*

3. **Tunneling operations:** replaces the sixth paragraph with the following

Joints will be designed by the Engineer and specified on the plans.

302.03 - **Procedures** – *is amended as follow*

(b) **Precast Drainage Structures:** - *add the following after the first paragraph*

Precast units, excluding concrete pipe and prestressed concrete items, conforming to the requirements herein will only be accepted under a Quality Assurance (QA) Program. The Contractor shall have the producer perform quality control functions in accordance with a VDOT’s approved QA plan. Each piece, manufactured under the QA program, in addition to the date and other required markings, shall be stamped with the letters (QC), as evidence that the required quality control procedures have been performed by the producer. Each shipping document shall be affixed with the following:
We certify that these materials have been tested and conform to VDOT Precast Concrete Products Quality Assurance Program.

_________________________________________________________
Signature and Title

(b) **Precast Drainage Structures**: *is amended as follow*

1. **Standard precast drainage units** – *replaces with the following paragraphs*

   **Standard precast drainage units** shall conform to the material requirements of AASHTO M 199 and the following:

   a. If the grade on the adjacent gutter is less than 1.5 percent, the grade on the invert of the throat section of the inlet shall be at least 1.5 percent. Precast throats having flat inverts will be permitted in sag locations provided the total length of the required throat opening does not exceed 6 feet.

   b. Pipe openings in precast drainage units shall not exceed the outside cross-sectional dimensions of the pipes by more than a total of 8” regardless of the placement of the pipes, the angles of intersection, or the shapes of the pipes. Pipe openings shall be formed, neatly drilled, or neatly cut.

   c. The Contractor shall use the connection specified on the plans to connect pipe to structure. In the event the joint is not specified, it shall be a leak-resistant joint.

   d. When precast units are to be located adjacent to the sub base or base pavement course, the Contractor shall furnish units with chambers having weep holes 3” in diameter and hardware cloth. Weep holes shall be located to drain the subbase or base.

   e. Precast units located adjacent to cast-in-place concrete items, such as flumes, ditches, and gutters shall be connected to the adjacent unit by means of No. 4 smooth steel dowels spaced on approximately 12” centers throughout the contact length and extending at least 4” into the precast unit and the cast-in-place item. If holes to receive the dowels are provided in the precast unit, they shall be not more than ⅝” in diameter. The Engineer must approve other methods of providing the connection, such as keyed joints prior to fabrication.

   f. The chamber section shall be installed in the plumb position. The throat and top sections shall have positive restraints, such as adjacent concrete, pavement, or soil, on all sides to prevent displacement and shall have a positive interlock, such as dowels, with the chamber section. The throat and top sections shall be installed to conform to the normal slope of the finished grade and may be canted up to a maximum grade of 10 percent. The chamber
may be built up to a maximum of 12” at any point to provide for complete and uniform bearing of the throat and top sections on the chamber flat slab top or other approved top section. The built-up section shall be constructed using whole concrete spacer units where feasible and partial and whole sections of concrete block or brick with high-strength grout and mortar. High-strength grout shall be used to provide the final grade adjustment and uniform bearing. The width of the built-up section shall match the wall thickness of the chamber section. The concrete block and brick shall be thoroughly bonded with mortar and the inside and outside of the built-up section shall be plastered with mortar except that the concrete spacer unit shall not be plastered.

2. **Precast arches** – is amended as follow
   c. **Joints**: replaces with the following paragraph

   **Joints**: Precast arch joints shall meet the requirements of AASHTO PP-63 and be on VDOT Materials Division Approved List No. 14 for pipe joints. The joint type shall be installed as specified on the plans, in the event the joint is not specified, it shall be a leak-resistant joint.

   (c) **Drop Inlets, Manholes, Junction Boxes, Spring Boxes, Intake Boxes, and Endwalls** - replaces the ninth paragraph with the following

   Inlet and outlet pipe connections shall be as specified on the plans. In the event the joint is not specified, it shall be a leak-resistant joint. Pipe sections shall be flush on the inside of the structure wall and shall project outside sufficiently for proper connection with the next pipe section. When masonry connections are used, the masonry shall fit neatly and tightly around the pipe, and shall be finished on the exterior of the structure prior to backfilling, and finished on the interior of the structure after backfilling of the structure.

   (c) **Drop Inlets, Manholes, Spring Boxes, Intake Boxes, Outlet Structures and End Walls**: - add the following paragraphs

   All drop inlets and manholes shall have full diameter invert shaping in accordance with VDOT Standard IS-1 and be provided with access steps in accordance with City of Virginia Beach Standards.

   When converting existing drop inlets to a junction box or manhole is specified, the frames, covers and grates shall be removed and the walls reconstructed as required. A top slab shall be constructed with a manhole ring and cover and shall be set to the required elevation. Upon completion, each structure shall be clean of any accumulation of silt, debris, or foreign matter and shall be kept clean of such accumulation until final acceptance of the work.

   Gravity sewers and sanitary force mains passing through storm manholes (conflict manholes) shall be constructed as shown on the plans or as directed by the Owner. The portion of the sewer pipe within the manhole shall be Ductile Iron Pipe. If existing pipe is not ductile iron, a section of existing pipe will be removed and replaced with a full joint of
Ductile Iron Pipe centered on the manhole. If joints in existing ductile iron pipe fall within the manhole, a section of pipe will be replaced as above so there is no joint within the manhole.

302.03 - Procedures – is amended as follow

(e) Select borrow for trench backfill: - add the following paragraph

Select borrow for trench backfill shall consist of furnishing and transporting select borrow for backfilling material for trenches made in the subgrade of the proposed improvement, and all trenches outside of the subgrade where the inner edge of the trench is closer than 2 feet to the edge of the proposed pavement, stabilized shoulder, curb, or sidewalk, as directed by the Owner. This item also includes the disposal of the surplus excavated material which is replaced by Select Borrow for Trench Backfill. Such disposal shall be made in accordance with Section 303.04 (k).

302.04 - Measurement and Payment - is amended as follow

Cast-in-place box culverts – replaces with the following paragraph

Cast-in-place box culverts will be measured in cubic yards of concrete and pounds of reinforcing steel and will be paid for at the contract unit price per cubic yard of concrete and per pound of reinforcing steel. These prices shall include sheeting, shoring, dewatering, waterproofing, disposing of surplus and unsuitable material, restoring existing surfaces, the upper 6” of bedding material within the neat lines shown on the Standard PB-1 drawings, and all necessary work to key the bottom slab into an existing rock foundation. When not a pay item the cost of temporary stream relocation to facilitate the installation of the structure shall be included in the price for the concrete and steel. Minor Structure Excavation will be paid for in accordance with Section 303 of the Specifications.

Precast box culverts – replaces with the following paragraph

Precast box culverts will be measured in linear feet along the centerline of the barrel from face of curtain wall to face of curtain wall and will be paid for at the contract unit price per linear foot, unless they are substituting for cast-in-place box culverts. In the event precast box culverts are substituted for cast-in-place box culverts, payment will be made at the contract unit price per cubic yard of concrete and per pound of reinforcing steel for the cast-in-place box culvert plan quantities. This price shall include designing, casting, reinforcing, sheeting, shoring, dewatering, installing, waterproofing, sealing joints, anchoring, disposing of surplus and unsuitable material, restoring existing surfaces, the upper 6” of bedding material within the neat lines shown on the Standard PB-1 drawings, fittings, and providing buffer zones and porous backfill for multiple lines. When not a pay item the cost of temporary stream relocation to facilitate the installation of the structure shall be included in the price for the box culvert. Minor Structure Excavation will be paid for in accordance with Section 303 of the Specifications.

Grates and frames – delete pay item. Grates and frames are incidental and included in the cost of the drainage structure.

Drop inlets and intake boxes – add the following paragraph
Drop inlets and intake boxes, both new and reconstructed will be measured as a complete unit of the type and class specified, including frame and grate or cover, and will be paid for at the contract unit price per each.

**Base sections of pipe tee units used as drop inlets and manholes** — replaces with the following paragraph

Base sections of pipe tee units used as drop inlets and manholes are incidental and included in the cost of the drainage structures. The riser section and additional costs for the tee shall be included in the price of the drop inlet or manhole.

**Manholes** — replaces with the following paragraph

Manholes will be measured as a complete unit of the type and class specified including frame and cover, and will be paid for at the contract unit price per each. Bedding material, except aggregate No. 57, shall be included in the unit price per each for the manhole.

**Concrete spring boxes** — delete the pay item

**Junction boxes** — replaces with the following paragraph

Junction boxes will be measured as a complete unit of the type and class specified including frame and cover, and will be paid for at the contract unit price per each. Bedding material, except aggregate No. 57, shall be included in the unit price per each for the junction box.

**Casting frames and covers** — delete the pay item. Casting frames and covers are incidental and included in the cost of the drainage structure.

**Storm water management drainage structure** — replaces with the following paragraph

Storm water management drainage structure shall be measured as a complete unit from the top of the concrete foundation to the top of the concrete cover and will be paid for at the contract unit price per each. The price bid shall include class A3 concrete, reinforcing steel, concrete cover, trash rack, debris rack, orifice, steps, steel plate; when required, polyethylene tubing, pipe hanger, steel pipe and Class A1 riprap.

**Temporary sediment riser pipe** — replaces with the following paragraph

Temporary sediment riser pipe shall be measured as a complete unit and will be paid for at the contract unit price per each. The price shall include the riser pipe, steel plate, perforated pipe, debris rack, orifice and Class A1 riprap, and anti-vortex device when required.

**Storm water management dam** — replaces with the following paragraph

Storm water management dam shall be measured as a complete unit and will be paid for at the contract unit price per each. The price shall include Class A3 concrete, reinforcing steel and Class A1 riprap.
302.04 - Measurement and Payment – *add the following pay items for payment*

**Convert drop inlets to junction box or manhole** will be measured as a completed unit including the manhole ring and cover, and will be paid for at the contract unit price per each. The riser section and additional costs for the modifications shall be included in the price of the junction box or manhole.

**Convert manhole to drop inlet** will be measured as a completed unit including the manhole ring and cover and will be paid for at the contract unit price per each. The riser section and additional costs for the modifications shall be included in the price of the drop inlet.

**Adjust existing manhole to grade** will be measured as a complete unit, and will be paid for at the contract unit price per each.

**Conflict manholes** shall be measured as a complete unit including the manhole ring and cover and will be paid for at the contract unit price per each. This price include new piping and the removal/disposal and replacement of any piping in accordance with the drawings and specifications, complete in place.

**Extra pipe bedding** shall be furnished for bedding to the full width of the trench permitted in VDOT PB-1 Standards for the size of pipe being installed. Extra Pipe Bedding shall be measured in tons in place, except that the quantity for which payment will be made shall not exceed the volume of the trench as computed using the maximum width of trench permitted and the actual depth of the completed excavation. Quantities in excess of the maximum specified herein shall be furnished by the Contractor at his expense. The conversion factor for correcting the bedding from cubic feet to tons is construed to be as follows: 1 cubic foot of stone weighs 100 lbs. This work will be paid for at the contract unit price bid per ton for Extra Pipe Bedding measured as specified. The provisions of Section 104.02 do not apply to this item.

**Select borrow for trench backfill, CBR - 15**, shall be measured and paid for at the contract unit price per cubic yard. The Provisions of Section 104.02 do not apply to this item.

Select borrow for trench backfill shall be furnished for backfilling to the full width of the trench. It shall be measured in cubic yards in place, except that the quantity for which payment will be made shall not exceed the volume of the trench as computed by using the maximum width of trench permitted by the specifications (PB-1) and the actual depth of the completed trench backfill above the center of the pipe, with a deduction for the volume of one-half of the pipe. Any trench backfill required in excess of the maximum quantity herein specified shall be furnished by the Contractor at his expense.

Any material meeting the requirements of Section 303, Select Borrow - CBR 15, which has been excavated from the trenches shall be used for backfilling the trenches. However, no compensation shall be allowed for select borrow for trench backfill for the portion of the trench backfilled with excavated material, obtained onsite.

Select borrow for trench backfill shall not be used until all suitable excavation obtained from the project limits has been utilized, unless otherwise authorized by the Owner.
302.04 - Measurement and Payment – amend and add the following pay items

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop inlet (Standard, type &amp; length)</td>
<td>Each</td>
</tr>
<tr>
<td>Intake box (Standard)</td>
<td>Each</td>
</tr>
<tr>
<td>Manhole (Standard)</td>
<td>Each</td>
</tr>
<tr>
<td>Junction box (Standard &amp; type)</td>
<td>Each</td>
</tr>
<tr>
<td>Stormwater management drainage structure (Type)</td>
<td>Each</td>
</tr>
<tr>
<td>Temporary sediment riser pipe (Size)</td>
<td>Each</td>
</tr>
<tr>
<td>Stormwater management dam</td>
<td>Each</td>
</tr>
<tr>
<td>Convert drop inlet to (Junction box or Manhole) (Type)</td>
<td>Each</td>
</tr>
<tr>
<td>Convert manhole to drop inlet (Type &amp; length)</td>
<td>Each</td>
</tr>
<tr>
<td>Drainage apron and chute</td>
<td>Each</td>
</tr>
<tr>
<td>Adjust existing manhole to grade</td>
<td>Each</td>
</tr>
<tr>
<td>Conflict manhole</td>
<td>Each</td>
</tr>
<tr>
<td>Extra pipe bedding</td>
<td>Ton</td>
</tr>
<tr>
<td>Select Borrow for trench backfill, CBR-15</td>
<td>Cubic Yard</td>
</tr>
</tbody>
</table>

SECTION 303 - EARTHWORK AND EMBANKMENT

303.01 - Description - add with the following paragraph

The Contractor shall place geotextile as shown on the plans or as directed by the Owner to stabilize the subgrade or embankment.

303.02 - Materials – add the following paragraphs

(f) Turbidity Curtain shall be synthetic fabric coated with suitable elastomeric or polymeric compound; having high resistance to weathering, hydrocarbons, fresh and salt water, and temperature extremes. The fabric shall be impervious or pervious as shown in the contract. Pervious is defined as 20% of the fabric material allowing the passage of water. The fabric shall have a tensile strength of not less than 200 pounds per square inch when measured lengthwise or crosswise. The curtain shall form a continuous vertical and horizontal barrier for the entire width and length of each section. Seams, if required, shall be either vulcanized welded or sewn and shall develop the full strength of the fabric.

Floatation shall be flexible, buoyant units contained in a floatation sleeve or collar attached to the curtain. Buoyancy provided by the floatation units shall be sufficient to support the required width of the curtain and maintain a freeboard of at least 3” above the water surface level, to a minimum of one foot above the bottom or a maximum ten foot depth at all stages of water levels.
Load lines shall be fabricated into the top and bottom of the curtain. The top load line shall consist of woven webbing or vinyl sheathed steel cable and shall have a break strength in excess of 10,000 pounds. The bottom loadline shall consist of a chain incorporated into the bottom hem of the curtain of sufficient weight to serve as ballast to hold the curtain in a vertical position. Additional anchorage shall be provided if necessary. The load lines shall have suitable devices, which develop the full breaking strength for connecting to load lines in adjacent sections.

(g) **Erosion Control Mulch** shall conform to the requirements of Section 244.02(g) 1.

(h) **Aggregate Material** shall be the size specified conforming to Section 203. The aggregate shall be placed at locations shown on the plans or as directed by the Owner. Aggregate material will be measured in units of tons for the size specified in accordance with Section 109. Payment will be made at the contract unit price per ton, which bid price shall be full compensation for furnishing, placing, and shaping and compaction, if required.

303.03 – Erosion and Siltation Control and Stormwater Pollution Prevention – *add the following to the first paragraph*

Any land disturbing activities, must have the appropriate erosion and sediment control. All erosion and sediment control must be done in accordance with the Virginia Erosion and Sediment Control Handbook.

303.03 – Erosion and Siltation Control and Stormwater Pollution Prevention – *is amend as follow*

(i) **Turbidity Curtain**: *add the following to the first paragraph*

Turbidity curtain shall be placed at the locations shown on the plans and in accordance with the approved working drawings. The Contractor shall maintain the turbidity curtain in order to insure the continuous protection of the waterway.

The depth of the curtain shall be such that it shall extend from the water surface to no less than one foot above the bottom, or no more than ten feet depth for the entire length of curtain at all stages of water level.

When the curtain is no longer required as determined by the Owner, the curtain and related components shall be removed in such a manner as to minimize turbidity. The curtain and related components shall become the property of the Contractor and shall be removed from the project.

(j) **Tree Protection and Preservation**: *add the following paragraphs*

**Tree Protection and Preservation:**

Groups of trees and individual trees denoted on the plans as "trees to be saved" or as directed by the Owner shall be protected from damage during construction. The limits of clearing shall be located outside the drip line of any tree to be retained, and in no case closer than five (5) feet to the trunk of such a tree.
1. **Marking:** Prior to construction, individual trees and stands of trees to be retained within the limits of clearing shall be visibly marked with a bright color paint or surveyor's ribbon applied in a band circling the tree at a height visible to equipment operators.

2. **Equipment Operation and Storage:** Heavy equipment, vehicular traffic, or stockpiles or any construction materials including topsoil shall not be permitted within the drip line of any tree to be retained. Trees being removed shall not be felled, pushed or pulled into trees being retained. Equipment operators shall not clean any part of their equipment by slamming it against the trunks of trees to be retained.

3. **Fire:** Fires shall not be permitted within 100 feet from the drip line of any trees to be retained. Fires shall be limited in size to prevent adverse effects on trees, and kept under surveillance.

4. **Storage and Disposal of Toxic Materials:** No toxic materials shall be stored closer than 100 feet to the drip line of any trees to be retained. Paint, acid, nails, gypsum board, wire, chemicals, fuels, lubricants shall not be disposed of in such a way as to injure vegetation.

5. **Tree Protection:** Trees and shrubbery to be retained within 40 feet of proposed construction shall be protected by either snow fence or board fence at locations indicated on the plans or as directed by the Owner. Contractor personnel must be instructed to honor all protective devices.
   
   a. **Tree fence** - Standard 40” high snow fence shall be placed at the limits of clearing on standard steel posts set 6 feet apart.
   
   b. **Board fence** - Board fencing consisting of 4” square posts set securely in the ground and protruding at least 4 feet above the ground shall be placed at the limits of clearing with a minimum of two horizontal boards between posts. If it is not practical to erect a fence at the drip line, a triangular fence may be constructed near the trunk. The limits of clearing will still be located at the drip line.

303.04 - **Procedures** - *is amended as follow*

   (a) **Regular Excavation:** - *remove the fourth and eighth paragraphs*

   (f) **Backfill for Replacing Undercut Excavation:** - *add the following paragraph*

   Regular excavation may be used for backfill provided the material is in substantial conformity with the requirements of Select Borrow. A certificate of conformity with these requirements from an approved independent testing lab shall be required before on site material can be used for backfill purposes. Backfill shall be compacted to 95 percent maximum density in accordance with Section 303.04. Material shall be placed in uniform layers not exceeding 8” in loose thickness and compacted prior to placing the next layer of
fill material. No additional compensation will be allowed for regular excavation, used in lieu of select borrow.

(k) **Surplus Material:** *add the following to the last paragraph*

The Contractor is responsible for the disposal of all surplus or unsuitable material off-site of the project.

303.04 - **Procedure** – *add the following paragraphs*

(n) **Geotextile:**

Geotextile shall be placed as shown on the plans. Geotextile shall be spliced by an overlap of at least 2 feet or by sewing double stitched seams with stitching spaced ¼” to ½” apart or as shown on the plans. The strength of sewn seams shall be no less than 85 percent to that of the geotextile when tested in accordance with ASTM D4884.

Once the geotextile is placed, the initial lift of material to be placed atop shall be free draining (any material having 15 percent or less of which will pass the #200 sieve) and shall be end dumped onto the geotextile and spread to thickness shown on plans. If the geotextile becomes punctured or torn, the Contractor shall repair the area with geotextile lapped at least 3 feet all around the damaged area.

303.06 – **Measurement and Payment**

(a) **Excavation:** *is amended as follow*

1. **Regular excavation:** *add the following to the first paragraph*

Measurement will be based on plan quantities. Removal of all concrete items shall be considered as regular excavation excluding removal of curb and gutter, removal of existing sidewalk, removal of existing curb cut ramps, and removal of existing concrete pavement.

2. **Borrow excavation:** *add the following to the first paragraph*

Select Borrow quantities will be measured in cubic yards, compacted, in final project location.

3. **Undercut excavation:** *add the following to the first paragraph*

Undercut excavation will include all unsuitable material removed below the cross-section prism for the roadway.

Undercut Excavation and Select Borrow, CBR-15 will not be subject to the provisions of Section 104.02, in regard to alteration of quantities.

4. **Minor structure excavation:** *replaces with the following paragraph*
Minor structure excavation will not be measured for payment. The cost of excavation will be included in the price bid for the pipe or structure and will include the cost of backfilling to original ground.

(b) Embankments – is amended as follows

2. If embankment is a pay item and regular excavation is to be paid for on a plan quantity basis – add the following paragraph

If embankment is placed prior to installation of a minor structure, excavation of the embankment area will not be measured for payment.

3. If embankment is a pay item and regular excavation is to be paid for on the basis of measured quantities – add the following paragraph

If embankment is placed prior to installation of a minor structure, excavation of the embankment area will not be measured for payment.

18. Erosion Control Mulch – replaces with the following paragraph

Erosion Control Mulch will be measured in square yards or acre of surface area, complete-in-place, and will be paid for at the contract unit price per square yard of surface area. This price shall include furnishing and applying mulch; and maintaining mulched areas until placement of the final soil retention covering, seeding or paving and all material and equipment necessary for the application.

303.06 - Measurement and Payment – add the following pay items for payment

21. Tree Fence will be measured and paid for in units of linear feet, complete in place. This price includes maintenance and removal.

22. Construction Entrance will be measured in tons, complete in place, of VDOT #1 course aggregate, based on certified weight delivery tickets. Construction Entrance will be paid for at contract unit price per ton and shall be full compensation for all labor, tools, equipment and incidentals necessary to complete the work. This will also include removal of the construction entrance upon completion of the project.

23. Geotextile will be measured in square yards complete-in-place. Overlaps and seams will not be measured for separate payment. The accepted quantity of geotextile will be paid for at the contract unit price per square yard, which price shall be full compensation for furnishing, placing, lapping or seaming material and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

303.06 - Measurement and Payment – add the following pay items

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree Fence</td>
<td>Linear foot</td>
</tr>
</tbody>
</table>
SECTION 307 – HYDRAULIC CEMENT STABILIZATION

307.02 - Materials – is amended as follow

(e) Hydraulic cement stabilized open-graded materials – add the following paragraphs

Hydraulic cement stabilized open-graded materials shall conform to the following requirements:

Hydraulic cement stabilized open-graded material shall conform to the requirements of Section 217 for hydraulic cement concrete.

Aggregate shall be coarse aggregate No. 57 or other approved aggregate grading, consisting of crushed stone conforming to the requirements of Section 203.

Curing material shall be white pigmented wax base concrete curing compound meeting the requirements of ASTM C-309.

307.05 - Procedures – add the following paragraphs

(g) Hydraulic cement stabilized open-graded material shall consist of an approved hydraulic cement, crushed, coarse aggregate No. 57 and water unless other aggregate grading’s are approved by the Owner. The following requirements shall be used:

1. Minimum hydraulic cement content shall be 235 pounds per cubic yard. The cement content will be determined by the titration method as described in VTM 40.

2. Water/cement ratio shall provide for 100-percent cement (paste) coverage of aggregate material without significant runoff of the cement/water portion of the mixture during transportation and placement.

3. Air entraining will not be required.

4. Consistency shall provide for the minimum amount of water consistent with the required workability to provide a uniform material and surface texture as determined through visual inspection by the Owner.

5. Strength tests will not be required.

6. Mixing shall be in an approved central mix concrete plant or pug mill, unless otherwise specified.
7. At the time of placing the material shall not be less than 40° F nor more than 95° F.

Hydrated lime shall be used in all mixtures at the rate of at least 0.5-percent by weight of the total dry aggregate. Chemical additives may be used in addition to or in lieu of lime with approval of the Owner based on previous approvals of chemicals used with the same aggregate in asphalt concrete mixes of other types as detailed in Section 211.

An approved anti-stripping additive may be used in addition to lime to provide better coating efficiency. The additive shall be proven to be compatible with the lime coated aggregate.

The foundation for hydraulic cement stabilized open-graded material shall have a uniformly moist surface when the hydraulic cement stabilized open-graded material is placed.

Hydraulic cement stabilized open-graded material shall be placed in accordance with the weather limitations of Sections 217.03, 316.04 (j) 3 and 316.04 (j) 4.

Stabilized open-graded material shall consist of furnishing and placing a course of stabilized open-graded material on a prepared subbase or subgrade in accordance with the Specifications and in reasonably close conformity with the lines and grades shown on the plans or established by the Owner. Stabilized open-graded material shall not be placed until the surface upon which it is to be placed has been approved by the Owner. Preparation shall include provision for surface drainage away from the material to prevent contamination from surface water in the event of rainfall.

The Contractor shall prevent contamination of the stabilized open-graded material. Material which, in the opinion of the Owner, has been contaminated or damaged shall be removed and replaced promptly by the contractor at no additional expense to the Owner.

The equipment shall be used for the construction of the stabilized open-graded course shall be approved prior to the performance of such work. Any machine, combination of machines or equipment, which will place the material without undue segregation and produce the completed course in accordance with the specifications for moistening, mixing, placing and compacting will be approved.

The finished surface of the stabilized open-graded material shall be uniform and shall not vary at any point more than 0.05-foot above or below the grade shown on the plans or established by the Owner.

Stabilized open-graded material with a surface higher than 0.05-foot above the grade established by the plans shall be removed and replaced with material, which complies with these specifications. If permitted by the Owner, the high spots may be removed to within specified tolerance by any method that does not produce contaminating fines or damage the base to remain in place, except that grinding will not be permitted.

Hardened stabilized open-graded material with a surface lower than 0.05-foot below the grade established by the plans shall be removed and replaced with stabilized open-graded material which complies with these specifications or, if permitted by the Owner, low areas may be filled with the
next pavement course in the same operation in which the pavement is placed at no additional expense to the Owner.

The Contractor shall not use the open-graded course as a haul road or storage area. Traffic will not be permitted on the open-graded course except for equipment required to place the next layer. Haul vehicles that are overweight or that have not had a legal load determination will not be permitted on the open-graded drainage course for any purpose.

Hydraulic cement stabilized open-graded material shall be deposited on the grade in such manner that a uniform and adequate supply is available for the finishing equipment. Approved concrete pavers conforming to the requirements of Section 316.03 or other equipment as approved by the Owner shall be used to place and consolidate the stabilized open-graded course. Screed or plate vibrators shall be used to consolidate the course to a consistent finish across the width of the course. It shall not be compacted to the point that it is not free draining or the aggregate is crushed. Necessary hand spreading shall be performed using square-faced shovels. The use of rakes or hoes will not be permitted. Workers will not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

Curing of the hydraulic cement stabilized open-graded material shall be by applying a white pigmented wax base concrete curing compound at a rate of 150-square feet per gallon after initial set of the base material or as directed by the Owner.

Acceptance of aggregate coating in hydraulic cement stabilized open-graded material shall be 100-percent surface coverage of the aggregate as verified by visual inspection.

Acceptance for cement content in hydraulic cement stabilized open graded material will be based on the mean of the result of tests performed on samples taken in a stratified random manner from each lot. The rate of sampling will be four samples per lot. A lot of material is defined as 2,000-tons of material.

A lot will be considered to be acceptable if the mean result of four tests is within ± 30-lbs. per cu. yd. of the minimum cement content. If an individual test result indicates that the cement content of the material is deficient by more than 35-lbs. from the design cement content, that portion of the material represented by the sample will be considered a separate part of the lot and may be removed from the roadway at the discretion of the Owner.

If the value of the test results falls below the minimum cement content, a payment adjustment will be applied to the contract unit price based on the following table:

<table>
<thead>
<tr>
<th>Cement Content (lbs./cu. yd.)</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>220 - 235</td>
<td>0%</td>
</tr>
<tr>
<td>215 - 219</td>
<td>4%</td>
</tr>
<tr>
<td>210 - 214</td>
<td>6%</td>
</tr>
<tr>
<td>205 - 209</td>
<td>8%</td>
</tr>
</tbody>
</table>

The adjustment will be applied to the tonnage represented by the samples.

Unless otherwise shown on the plans, the Contractor has the option of using either hydraulic cement stabilized open-graded material or asphalt cement stabilized open-graded material Type
Hydraulic cement stabilized open-graded material will be measured and paid for as stabilized open-graded material, in tons, complete-in-place. This price shall be full compensation for furnishing and placing, cement, aggregate, lime, curing, removing and replacing unstable subgrade or subbase, preparing and shaping the subgrade or subbase, for constructing and finishing shoulders and ditches and for disposal of unsuitable material.

### Pay Item

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic cement stabilized open-graded material</td>
<td>Ton</td>
</tr>
</tbody>
</table>

### SECTION 310 - TACK COAT

310.01 - Description - add the following paragraph

Where liquid emulsions are specified in the Contract, cutback asphalt may be substituted only when approved by the Owner.

### SECTION 315 - ASPHALT CONCRETE PAVEMENT

315.02 - Materials – add the following paragraphs

(f) Liquid Asphalt Material shall conform to the requirements of Section 210.

(g) Asphalt cement stabilized open-graded material Type I, Type II or Type III shall conform to the following requirements:

Asphalt cement stabilized open-graded material Type I, Type II or Type III shall conform to the requirements of Section 211

Coarse aggregate shall be Grade A crushed stone conforming to the requirements of Section 203 and shall conform to the soundness requirements of surface course stone.

Fine aggregate shall conform to Section 202 and shall conform to the requirements of aggregate for use in concrete subject to abrasion.

Asphalt cement shall be PG 70-22.

Reclaimed asphalt pavement may not be used as component material unless approved by the Owner.
315.03 - Equipment – is amended as follow

(f) **Stabilized Open-Graded Course:** *add the following paragraph*

**Stabilized Open-Graded Course:** The equipment shall be used for the construction of the stabilized open-graded course shall be approved prior to the performance of such work. Any machine, combination of machines or equipment, which will place the material without undue segregation and produce the completed course in accordance with the specifications for moistening, mixing, placing and compacting will be approved.

315.04 - Placement Limitations – is amended as follow

(c) **Asphalt cement stabilized open graded material:** *add the following paragraphs*

**Asphalt cement stabilized open graded material:** The Contractor shall submit or shall have his source of supply submit, for the Owner's approval, a mix design or job-mix formula for each mixture according to Section 211.03 for asphalt stabilized open-graded material.

Stabilized open-graded material shall be designed to have an in-place coefficient of permeability of at least 1000-feet per day, when tested in accordance with VTM-84.

The following design ranges shall be used for asphalt cement stabilized open-graded material:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>% Passing</th>
<th>Sieve</th>
<th>% Passing</th>
<th>Sieve</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½ &quot;</td>
<td>Min. 100</td>
<td>1 ½ &quot;</td>
<td>Min. 100</td>
<td>1 ½ &quot;</td>
<td>Min. 100</td>
</tr>
<tr>
<td>1&quot;</td>
<td>95 ± 5</td>
<td>1&quot;</td>
<td>96 ± 4</td>
<td>1&quot;</td>
<td>97.5 ± 2.5</td>
</tr>
<tr>
<td>½&quot;</td>
<td>43 ± 9</td>
<td>½&quot;</td>
<td>54 ± 14</td>
<td>½&quot;</td>
<td>70 ± 8</td>
</tr>
<tr>
<td>#4</td>
<td>Max. 10</td>
<td>#4</td>
<td>25 ± 6</td>
<td>#4</td>
<td>Max. 25</td>
</tr>
<tr>
<td>#8</td>
<td>Max. 5</td>
<td>#8</td>
<td>20 ± 4</td>
<td>#8</td>
<td>Max. 8</td>
</tr>
<tr>
<td>#200</td>
<td>Max. 5</td>
<td>#200</td>
<td>Max. 5</td>
<td>#200</td>
<td>Max. 5</td>
</tr>
<tr>
<td>A.C. Content 2.0 ± 0.5%</td>
<td>A.C. Content 3.0 ± 0.5%</td>
<td>A.C. Content 2.5 ± 0.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The mix temperature shall be between 210° F and 280° F.

Marshall Design test data will not be required.

Stabilized open-graded material shall not be placed when weather or surface conditions are such that the material cannot be properly handled, finished or compacted. The surface upon which mixtures are to be placed shall be free of standing water at the time such materials are spread.

Stabilized open-graded material shall not be left exposed to severe weather conditions for extended periods of time unless proper drainage is provided. The next course in the construction sequence shall be placed within 45 days of acceptance of the open-graded
course. In no case shall the stabilized open-graded course be left unprotected through the winter.

Asphalt cement stabilized open-graded material shall be spread only when the atmospheric temperature is above 40°F, and the surface temperature upon which it is to be placed is no less than 35°F.

Asphalt cement stabilized open-graded course shall not be cooled with water.

Vibratory rollers shall not be used on the asphalt stabilized open-graded course.

315.05 - Procedures – is amended as follow

(c) Placing and Finishing: - replaces the third paragraph with the following

The longitudinal joint in one layer shall offset that in the layer immediately below by approximately 6” or more. The joint in the wearing surface shall be offset 6” to 12” from the centerline of the pavement if the roadway comprises two traffic lanes. The joint shall be offset approximately 6” from the lane lines if the roadway is more than two lanes in width. The longitudinal joint shall be uniform in appearance. If the offset for the longitudinal joint varies from a straight line more than 2” in 50 feet on tangent alignment, or from a true arc more than 2” in 50 feet on curved alignment, the Contractor shall seal the joint using a water-proof sealer at no cost to the Owner. The Contractor shall recommend a sealant and installation procedure to the Owner for approval before proceeding. If the offset for the longitudinal joint varies from a straight line more than 3” in 50 feet on tangent alignment, or from a true arc more than 3” in 50 feet on curved alignment, the Owner may reject the paving. The Owner will not require offsetting layers when adjoining lanes are paved in echelon and the rolling of both lanes occurs within 15 minutes after laydown.

(g) Rumble Strips: - replaces with the following paragraphs

Rumble Strips: This work shall consist of constructing rumble strips or rumble stripes on mainline shoulders of highways by cutting concave depressions into existing asphalt concrete surfaces as shown on the Standards Drawings and as directed by the Owner. Rumble strips are defined as edge line or centerline rumble strips with permanent longitudinal pavement markings subsequently installed within the rumble strip grooves.

Rumble strips and rumble stripes shall be installed in accordance with the RS-Series Standard Drawings. The Contractor shall demonstrate to the Owner the ability to achieve the desired surface regarding alignment, consistency, and conformity with these specifications and the Standards Drawings prior to beginning production work on mainline shoulders or centerlines. The test site shall be approximately 25 feet longitudinally at a location mutually agreed upon by the Contractor and Owner.

Rumble strips and rumble stripes shall be coated with liquid asphalt coating (emulsion) when the rumble strips or rumble strips are being cut into an existing asphalt surface (i.e. more than one year since placement); when new rumble strips or rumble strips are being cut into the pavement surface in conjunction with a surface treatment, latex emulsion, or
slurry seal pavement operation; or when the proposed plant mix surface is less than one inch deep.

Liquid asphalt coating (emulsion) shall not be used when rumble strips or rumble strips are being cut into new pavement, or being cut in conjunction with plant mix paving operations where the proposed plant mix surface is one inch or greater in depth.

When liquid asphalt coating (emulsion) is required, the Contractor shall coat the entire rumble strip area with the liquid asphalt coating (emulsion) using a pressure distributor following the cutting and cleaning of the depressions of waste material. For rumble strips installed on the shoulder, the approximate application rate shall be 0.1 gallons/square yard. When the rumble strip is installed along the centerline, the approximate application rate shall be 0.05 gallons/square yard. The application temperature shall be between 160° F and 180° F. For shoulder rumble strips only, overspray shall not extend more than 2” beyond the width of the cut depressions and shall not come in contact with pavement markings.

Pavement markings for rumble stripes shall be applied after the grooves have been cut. The grooves shall be thoroughly cleaned and the surfaced prepared prior to pavement marking application, in accordance with the Standard Drawings and Section 704 of the Specifications. Overspray of pavement marking materials shall not extend more than one inch beyond the lateral position of the pavement marking line shown in the RS-Series Standard Drawings.

Rumble strips shall not be installed on shoulders of bridge decks, in acceleration or deceleration lanes, on surface drainage structures, or in other areas identified by the Owner.

Waste material resulting from the operation shall be removed from the paved surface and shall not be disposed of where waterways may be at risk of contamination

(i) **Stabilized open-graded material:** — *add the following paragraphs*

**Stabilized open-graded material:** The work shall consist of furnishing and placing a course of stabilized open-graded material on a prepared subbase or subgrade in accordance with the Specifications and in reasonably close conformity with the lines and grades shown on the plans or established by the Owner. Stabilized open-graded material shall not be placed until the surface upon which it is to be placed has been approved by the Owner. Preparation shall include provision for surface drainage away from the material to prevent contamination from surface water in the event of rainfall.

The Contractor shall prevent contamination of the stabilized open-graded material. Material which, in the opinion of the Owner, has been contaminated or damaged shall be removed and replaced promptly by the contractor at no additional expense to the Owner.

The finished surface of the stabilized open-graded material shall be uniform and shall not vary at any point more than 0.05-foot above or below the grade shown on the plans or established by the Owner.
Stabilized open-graded material with a surface higher than 0.05-foot above the grade established by the plans shall be removed and replaced with material, which complies with these specifications. If permitted by the Owner, the high spots may be removed to within specified tolerance by any method that does not produce contaminating fines or damage the base to remain in place, except that grinding will not be permitted.

Hardened stabilized open-graded material with a surface lower than 0.05-foot below the grade established by the plans shall be removed and replaced with stabilized open-graded material which complies with these specifications or, if permitted by the Owner, low areas may be filled with the next pavement course in the same operation in which the pavement is placed at no additional expense to the Owner.

The Contractor shall not use the open-graded course as a haul road or storage area. Traffic will not be permitted on the open-graded course except for equipment required to place the next layer. Haul vehicles that are overweight or that have not had a legal load determination will not be permitted on the open-graded drainage course for any purpose.

Asphalt cement stabilized open-graded material shall be placed in one layer by approved equipment conforming to the requirements of Section 315.03. Compaction shall begin when the internal mat temperature is approximately 150°F to 200°F. A static, steel, 2 wheel roller shall compact the material in 1 to 3 passes in an established pattern approved by the Owner. The mat shall be compacted sufficiently to support the placement of the next layer but not to the point that it is not free draining or that the aggregate is crushed. A light roller may be used to remove roller marks on the day after placement of the material at the direction of the Owner.

Placement of the next higher pavement layer shall be suspended if any visible damage occurs to the stabilized open-graded material and construction of the next layer shall not proceed until directed by the Owner.

Unless otherwise shown on the plans, the Contractor has the option of using either hydraulic cement stabilized open-graded material or asphalt cement stabilized open-graded material Type I, Type II, or Type III.

315.07- Pavement Tolerance – is amended as follow

(d) Open Graded Material: - add the following paragraphs

Open Graded Material: Acceptance for gradation and asphalt cement content of the asphalt cement stabilized open-graded material will be in accordance with Section 211.08.

Acceptance for aggregate coating in asphalt cement stabilized open-graded material shall be in accordance with AASHTO T195 or as directed by the Owner.

315.08 - Measurement and Payment – replaces with the following paragraphs

Liquid Asphalt Coating (rumble strips) will not be measured for separate payment and will be included in the cost of the Rumble Strips.
315.08 - Measurement and Payment – *add the following pay item for payment*

*Asphalt cement stabilized open-graded material* will be measured and paid for as stabilized open-graded material, in tons, complete-in-place. This price shall be full compensation for furnishing and placing, asphalt material, aggregate, removing and replacing unstable subgrade or subbase, preparing and shaping the subgrade or subbase, for constructing and finishing shoulders and ditches and for disposal of unsuitable material.

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt cement stabilized open-graded material</td>
<td>Ton</td>
</tr>
</tbody>
</table>

SECTION 317—STONE MATRIX ASPHALT CONCRETE PLACEMENT

317.06 - Weather Restrictions – *replaces with the following paragraph*

317.06 - Weather Restrictions

SMA mixture shall be placed only when the ambient and surface temperatures are $50^\circ$ F or above.
DIVISION IV

BRIDGES AND STRUCTURES
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**Division IV - Bridges and Structures**

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<tr>
<td>Section 406 - Reinforcing Steel</td>
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</tr>
<tr>
<td>Section 408 - Bearing Devices and Anchors</td>
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</tr>
</tbody>
</table>
SECTION 403 - BEARING PILES

403.07 - Determination of Nominal Pile Resistance – is amended as follows

(d) Dynamic Formula – replaces the equation with the following

\[ R_{ndr} = 1.75(E_d)^{0.5} \log_{10}(10N_b) - 100 \]

where:

- \( R_{ndr} \) = nominal pile resistance measured during pile driving (kips)
- \( E_d \) = developed hammer energy. This is the kinetic energy in the ram at impact for a given blow. If ram velocity is not measured, it may be assumed equal to the potential energy of the ram at the height of the stroke, taken as the ram weight times the actual stroke (ft-lbs)
- \( N_b \) = number of hammer blows for 1” of pile permanent set (blows/in.)

SECTION 404 - HYDRAULIC CEMENT CONCRETE OPERATIONS

404.02 - Materials - add the following paragraph

(i) Expansion joint filler and sealer materials shall conform to Section 212.

404.08 - Measurement and Payment - add the following pay item for payment

Clean and reseal expansion joints will be measured in linear feet, complete-in-place. Clean and reseal expansion joints will be paid for at the respective contract unit price per linear foot, which price shall be full compensation for cleaning joints, furnishing and installing premolded joint filler, hot-applied joint sealer, cold-applied joint sealer, removal and disposal of debris, and all material, labor, tools, equipment and incidentals necessary to complete the work.

404.08 - Measurement and Payment - add the following pay item

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean and reseal expansion joint</td>
<td>Linear foot</td>
</tr>
</tbody>
</table>

SECTION 406 - REINFORCING STEEL

406.03 - Procedures - is amended as follows

(c) Fabrication: - replaces the first paragraph with the following
Fabrication: Bent bar reinforcement shall be cold bent to the shape shown on the plans. Fabrication shall be in accordance with the ACI Detailing Manual – 2004 (SP-66-04).

(d) Placing and Fastening: – replaces with the following paragraph

Placing and Fastening: Steel reinforcement shall be firmly held during the placing and setting of concrete. Bars, except those to be placed in vertical mats, shall be tied at every intersection where the spacing is more than 12” in any direction. Bars in vertical mats and in other mats where the spacing is 12” or less in each direction shall be tied at every intersection or at alternate intersections provided such alternate ties will accurately maintain the position of steel reinforcement during the placing and setting of concrete. Placing reinforcing steel in concrete after concrete has been freshly placed is not permitted.

Unless otherwise specified by the Engineer, tie wires used with corrosion resistant reinforcing steel can be: solid stainless; or plastic-coated carbon (black) steel wire.

The minimum clear distance from the face of the concrete to any reinforcing bar shall be maintained as specified in the table below.

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum Cover (in)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Normal Condition</td>
</tr>
<tr>
<td>Pier caps, bridge seats and backwalls:</td>
<td></td>
</tr>
<tr>
<td>Principal reinforcement</td>
<td>2 ¾</td>
</tr>
<tr>
<td>Stirrups and ties</td>
<td>2 ¼</td>
</tr>
<tr>
<td>Pier caps, bridge seats and backwalls (at open joint locations):</td>
<td></td>
</tr>
<tr>
<td>Principal reinforcement</td>
<td>3 ¾</td>
</tr>
<tr>
<td>Stirrups and ties</td>
<td>3 ¼</td>
</tr>
<tr>
<td>Footings and pier columns:</td>
<td></td>
</tr>
<tr>
<td>Principal reinforcement</td>
<td>3</td>
</tr>
<tr>
<td>Stirrups and ties</td>
<td>2 ½</td>
</tr>
<tr>
<td>Cast-in-place deck slabs:</td>
<td></td>
</tr>
<tr>
<td>Top reinforcement¹</td>
<td>2 ½</td>
</tr>
<tr>
<td>Bottom reinforcement</td>
<td>1 ¼</td>
</tr>
<tr>
<td>Precast and cast-in-place slab spans:</td>
<td></td>
</tr>
<tr>
<td>Top reinforcement¹</td>
<td>2 ½</td>
</tr>
<tr>
<td>Bottom reinforcement</td>
<td>2</td>
</tr>
<tr>
<td>Prestressed slabs and box beams:</td>
<td></td>
</tr>
<tr>
<td>Top steel</td>
<td>1 ¾</td>
</tr>
<tr>
<td>Stirrups and ties</td>
<td>1 ⅝</td>
</tr>
<tr>
<td>Location</td>
<td>Normal Condition</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Reinforcement concrete box culverts and rigid frames with more than 2 ft. fill over top of slab:</td>
<td></td>
</tr>
<tr>
<td>Top slab – top reinforcement</td>
<td>1½</td>
</tr>
<tr>
<td>Top slab – bottom reinforcement</td>
<td>1½</td>
</tr>
<tr>
<td>Inside walls and bottom slab top mat</td>
<td>1½</td>
</tr>
<tr>
<td>Outside walls and bottom slab bottom mat</td>
<td>1½</td>
</tr>
<tr>
<td>Reinforcement concrete box culverts and rigid frames with less than 2 ft. fill over top of slab:</td>
<td></td>
</tr>
<tr>
<td>Top slab – top reinforcement</td>
<td>2½</td>
</tr>
<tr>
<td>Top slab – bottom reinforcement</td>
<td>2</td>
</tr>
<tr>
<td>Inside walls and bottom slab top mat</td>
<td>1½</td>
</tr>
<tr>
<td>Outside walls and bottom slab bottom mat</td>
<td>1½</td>
</tr>
<tr>
<td>Rails, rail posts, curbs and parapets:</td>
<td></td>
</tr>
<tr>
<td>Principal reinforcement</td>
<td>1½</td>
</tr>
<tr>
<td>Stirrups, ties and spirals</td>
<td>1</td>
</tr>
<tr>
<td>Concrete piles cast against or permanently exposed to earth (not applicable for prestressed concrete):</td>
<td></td>
</tr>
<tr>
<td>Principal reinforcement</td>
<td>3</td>
</tr>
<tr>
<td>Ties and spirals</td>
<td>3½</td>
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<tr>
<td>Drilled shafts:</td>
<td></td>
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<tr>
<td>Principal reinforcement</td>
<td>4</td>
</tr>
<tr>
<td>Ties and spirals</td>
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</tr>
<tr>
<td>All other components not indicated above:</td>
<td></td>
</tr>
<tr>
<td>Principal reinforcement</td>
<td>2</td>
</tr>
<tr>
<td>Stirrups and ties</td>
<td>2</td>
</tr>
</tbody>
</table>

1Corrosive environment affects cover where concrete surface is in permanent contact with corrosive soil.
2Marine includes all locations with direct exposure to brackish and salt water including locations up to MHHW plus 2’.
3Includes ½” monolithic (integral) wearing surface.

Bars that must be positioned by maintaining clearances from more than one face shall be centered so that clearances indicated by the plan dimension of bars are equalized.

Bars shall be placed so that the concrete cover as indicated on the plans will be maintained within a tolerance of 0 to + ½” in the finally cast concrete.

Where anchor bolts interfere with reinforcing steel, the steel position shall be adjusted without cutting to permit placing anchors in their proper locations.
Plastic (composite) chairs may be used to support Corrosion Resistant Reinforcement (CRR) in precast concrete elements; otherwise, CRR in structures shall be supported by steel bar supports as follows, unless otherwise specified by the Engineer:

1. For Class I CRR, steel bar supports shall be: plastic-protected wire bar supports (per CRSI Class 1 – Maximum Protection) when stay-in-place forms are not used and the steel bar support will be exposed.

2. For Class II and Class III CRR, steel bar supports shall be: either stainless steel wire bar supports or plastic-protected wire bar supports (per CRSI Class 1 – Maximum Protection) when stay-in-place forms are not used and the steel bar support will be exposed.

3. Steel bar supports for CRR shall be fabricated from cold-drawn carbon steel wire conforming to the CRSI corrosion protection class listed above for their specific use, except for plastic-protected wire bar supports, which shall be plastic-coated with plastic protection applied by dipping legs (i.e., capping legs with premolded plastic tips is prohibited).

Carbon (black) steel in structures shall be supported by bright basic wire bar supports (per CRSI Class 3 – No Protection), except when cast-in-place members are cast directly on soil or rock, such as footings and approach slabs. In these cases, precast concrete supports and plastic (composite) chairs may be used. Steel bar supports for carbon (black) steel shall be fabricated from cold-drawn carbon steel wire. Precast concrete bar supports shall have a 28-day design compressive strength of at least 4,500 pounds per square inch and shall be furnished with plastic ties or shaped to prevent slippage from beneath the reinforcing bar.

Side form spacers shall meet the same corrosion protection level as the bar supports.

Bar supports for CRR in bridge decks and slab spans shall be spaced as recommended by CRSI but not more than 4 feet apart transversely or longitudinally. The mat of steel reinforcement closest to the surface shall be supported by bolster supports or individual chair bar supports and intermediate and upper mats can be supported by individual high chair bar supports or continuous bar supports placed between mats. When the upper mat is supported by the bottom mat (e.g., using continuous bar supports placed between mats), all the bar supports shall be spaced as recommended by CRSI but not more than 3 feet apart transversely or longitudinally. Bar supports shall be firmly stabilized so as not to displace under construction activities. Standees (a bar bent to a U-shape with 90° bent legs extending in opposite directions at right angles to the U-bend acting as a high chair resting on a lower mat of reinforcing bars to support an upper mat) may be used on simple slab spans provided they hold the reinforcing steel to the requirements specified herein and are firmly tied to the lower mat to prevent slippage. The use of standees will not be permitted for the top mat of steel on any continuous slab spans.
In reinforced concrete sections or elements other than bridge decks and slab spans, the specified clear distance from the face of concrete to any reinforcing bar and the specified spacing between bars shall be maintained by means of approved types of stays, ties, hangers, or other supports adhering to the CRSI corrosion protection classes and specific uses listed above. The use of pieces of gravel, stone, brick, concrete, metal pipe, or wooden blocks will not be permitted as supports or spacers for reinforcing steel. The clear distance between bars shall be at least 1 ½ times the specified maximum size of coarse aggregate but not less than 1 ½”. Before concrete is placed, the Owner will inspect reinforcing steel and determine approval for proper position and the adequacy of the method for maintaining position.

(e) **Splicing and Lapping** – *replaces the fourth paragraph with the following*

For corrosion resistant reinforcing bars, mechanical butt splicers shall be of the same material as the bars being spliced.

**SECTION 408 - BEARING DEVICES AND ANCHORS**

408.02 - **Materials and Fabrication** – *is amended as follow*

(f) **Adhesive Anchors** – *add the following paragraph*

Adhesive Anchors shall be one of those listed on the VDOT's approved list. The adhesive accompanying each anchor shipment shall have on its label, the batch or lot number and the shelf life or expiration date of the material. In addition, the Contractor shall have the manufacturer maintain a test data file, including the result of the pullout test that shall be made available to the Owner, upon request. Such information shall be kept on file for at least 3 years from date of installation.

408.03 - **Procedures** – *is amended as follow*

(i) **Adhesive Anchors** – *add the following paragraphs*

Adhesive Anchors shall consist of furnishing and installing adhesive anchors in accordance with the Contract documents in the sizes indicated on the plans, specifications or as directed by the Owner. Adhesive anchors may be used wherever cast-in-place anchors are not required. Adhesive anchors may be either one-piece, threaded, grooved or swaged rod or bolt; or two-piece female adhesive anchor into which a bolt or threaded rod is inserted, according to the application required.

Adhesive anchors shall be installed in accordance with the manufacturer's recommendations and shall not be installed until after concrete has attained the minimum design compressive strength. Anchors shall be free of rust, grease, oil and other contaminants. Prior to general installation, three anchors shall be installed, tested and approved by the Owner.
1. Testing:

The Contractor shall test the installed adhesive anchors for adequacy of the adhesive system as specified herein. The Contractor shall notify the Owner at least two days prior to testing. The tests shall be performed in the presence of the Owner. Three anchor systems shall be tested per 100 anchors or fraction thereof.

The test jack shall have been calibrated by an approved testing agency within 6 months.

On new concrete, testing equipment shall consist of a calibrated hydraulic centerhole jack. The jack shall be placed on a plate washer that has a hole at least ⅛” larger than the diameter of the adhesive anchor and positioned on center to allow an unobstructed pull. Unless otherwise specified, the test load shall be 69,300 psi applied to the tensile stress area of the bolt or rod being anchored.

On existing concrete, a calibrated hydraulic jack shall be centered over the anchor such that the resultant tensile forces shall act on the anchor, adhesive and surrounding concrete in as equal a manner as possible. Any apparatus that results in a possible failure in any of the three mediums will be satisfactory. The test loads shall be as specified hereinbefore.

The anchor shall be considered acceptable when held under load for three minutes without detectable movement. Movement of an anchor will be cause for rejection of that anchor and those others installed on the same day except that each anchor installed that day may be tested and accepted individually.

The Contractor shall submit a completed report to the Owner which includes the certificate of jack calibration, number and location of bolts tested, load applied, time for which load was applied, and results of tests, epoxy batch number, shelf life and test data.

2. Drilling and Inspection of Holes:

A jig, template or guide shall be provided by the Contractor to ensure correct position of the holes and proper alignment perpendicular to the surface during the drilling process. Upon approval by the Owner, the whole locations may be adjusted to avoid encountering reinforcing steel. The holes shall be drilled by a method approved by the Owner. The diameter of the drilled hole shall be in strict accordance with the manufacturer's recommendations.

Prior to installing anchor, holes shall be blown free of dust and debris with oil-free compressed air. Holes shall then be brushed with a stiff-bristled brush of a sufficient size to effectively remove dust from the sides of hole and the
holes blown free of dust again. This procedure shall be repeated until the hole is completely clean. Each hole shall be checked with a depth gage to ensure proper depth.

Concrete spalled or otherwise damaged by the Contractor's operations shall be repaired in manner satisfactory to the Owner at no additional cost to the Owner.

Each hole shall be inspected by the Owner immediately prior to the placement of adhesive and anchors. All holes shall be clean and dry. Any hole found not meeting these requirements will be reworked by whatever means necessary to ensure an acceptable installation.

408.04 - Measurement and Payment - add the following pay item for payment

When the Contract does not include a separate bid item for anchors, the cost of adhesive anchors shall be included in the price bid for other appropriate items. When the contract includes a pay item for adhesive anchors, they will be paid for on an each basis, which price shall include furnishing and installing anchors, testing and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

408.04 - Measurement and Payment - add the following pay item

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesive anchors</td>
<td>Each</td>
</tr>
</tbody>
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INCIDENTAL CONSTRUCTION
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## Division V - Incidental Construction

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<td>504</td>
<td>Sidewalks, Steps and Handrails</td>
<td>7</td>
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<tr>
<td>505</td>
<td>Guardrail and w-Beam Median Barriers</td>
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<td>Demolition of Pavement and Obscuring Roadway</td>
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<td>Relocating or Modifying Existing Miscellaneous Items</td>
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<td>24</td>
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<tr>
<td>522</td>
<td>Test Pits</td>
<td>80</td>
</tr>
</tbody>
</table>
SECTION 502 - INCIDENTAL CONCRETE ITEMS

502.03 - Procedures – add the following paragraphs:

(e)  **Curb Ramp with Detectable Warning Surfaces:** The installation of the concrete curb ramp and transition slope ramps shall be constructed according to the contract document and Section 502 of the Specifications, Section 504 for hydraulic cement concrete sidewalk, details shown in the VDOT Road and Bridge Standards (CG-12). The detectable warning/truncated domes and detectable devices tiles that shall be installed in accordance with the details in this section, the manufacturer's recommendations where applicable, the VDOT Road and Bridge Standards and the contract documents.

Curb ramp and transition slope ramp floors shall be 7” thick Class A-3 concrete or, if precast, 7” thick Class A-4. Transition slope ramps may be poured monolithically with curb ramp floor or by using permissible construction joint with required bars. The required bars shall be 8” in length No. 5 rebar and placed 12” from center to center along both of the curb ramp floors, mid-depth of the ramp floor, with 1½” minimum concrete cover. If curb ramp floor is precast, holes must be provided for dowel bars so that adjoining flared transition slope ramps can be cast in place after the placement of the precast curb ramp. The finished surface of the curb ramp and transition slope ramps shall be uniformly profiled to match the adjoining surfaces without lips or obstructions and shall drain completely. The location and orientation of the curb ramps shall be constructed as shown in the contract documents or directed by the Owner.

Curb ramp running slopes at unrestrained sites shall not be steeper than 1:12 (0.0833) and the cross slope shall not be steeper than 1:48 (0.02). Transition slope ramps shall not be steeper than 1:12 (0.0833). When altering existing sidewalk, where existing site development precludes the accommodation of a ramp slope of 1:12 (0.0833), a running slope between 1:12 (0.0833) and 1:10 (0.10) is permitted for a rise of 6” maximum and a running slope of between 1:10 (0.10) and 1:8 (0.125) is permitted for a rise of 3” maximum. In historic facilities, a 1:6 (0.1667) ramp with a maximum run of 2” is permitted if a lesser slope is not feasible and if the historic significance of the facility would be treated or destroyed through the use of complying ramp. Curb ramp running slope shall not exceed 8 feet in length, except at sites where the contract documents specify a greater length.

Where a curb ramp is constructed within the existing curb, combination curb and gutter and/or sidewalk, the existing curb or combination curb and gutter shall be removed to the nearest joint beyond the curb transitions or to the extent that no remaining section of curb or curb and gutter is less than 5 feet long. The existing sidewalk shall be removed to the nearest joint beyond the transition slope ramps or walk around or to the extent that no remaining section of sidewalk is less than 5 feet long.
When a curb ramp and transition slope ramps are constructed with bricks or concrete pavers, the bricks and concrete pavers shall be installed in accordance with manufacturer’s specifications or contract documents and Supplemental Specifications for Unit Paving.

Detectable warning surface tile shall extend the full width of the curb ramp or landing and in the direction of travel 24” from the back of curb. The detectable warning surface shall not be installed on the transition slope ramps. The detectable warning surface shall be located so that the edge nearest the curb line is between 6” and 8” from the face of curb unless noted in the contract documents.

Domes shall be aligned on a square grid, aligned in rows parallel and perpendicular to the predominant direction of travel. The domes must not be skewed diagonally to the direction of travel.

All permanent installations of detectable warning surfaces shall be “wet set” in freshly placed concrete. Concrete pavers shall be wet set in concrete with a minimum of 4” of concrete underneath, unless otherwise shown on the plans or recommended by the manufacturer.

Surface mounted detectable warning surfaces are permitted only for temporary installations where the detectable warning will be in service 6 months or less.

The contractor shall provide the Owner with the detectable warning surface manufacturer’s installation instructions at least 48 hours in advance of the start of installation.

After the installation of the detectable warning surface tile, the surface of the tile shall be free of any debris, concrete and sealant and shall be cleaned according to the manufacturer recommendations.

The Contractor and manufacturer shall jointly warrant the installed detectable warning surface to last no less than two years without losing more than one percent of the truncated domes due to delaminating as a result of product failure and shall further warrant the surface for a minimum of five years against fading, chipping, peeling, cracking or loss of original shade due to sunlight, salt or exposure to weathering.

**502.04 - Measurement and Payment - add the following pay items for payment:**

**Curb Ramp with Detectable Warning Surface, Cast-In-Place** will be measured in square yards of finished surface and detectable warning surface, complete-in-place, and paid for at the contract unit price per square yard. This price shall be full compensation for furnishing and installing a curb ramp with the approved cast-in-place detectable (truncated domes) warning surface tile, including but not limited to, layout, excavation, bedding, concrete and/or brick pavers or concrete pavers, detectable warning surface tile, integral visual contrast, surface preparation, saw-cutting, dowels or...
other anchorage devices, bars, surface sealant, repairs and cleaning of the adjoining areas disturbed by the installation, and all other labor, tools, equipment, materials and incidentals necessary to complete the work. The curb ramp shall be measured and paid by the type of surface material (concrete, and/or concrete pavers or brick pavers) and the cast-in-place detectable warning surface application. Brick pavers and concrete pavers shall include the cost of the brick pavers and concrete pavers, bedding materials, handling, installation, and any other incidental work required to complete the curb ramps. The quantities of the concrete and/or concrete pavers or brick pavers, and detectable warning surface shall be computed as the actual quantity of the material installed in place.

Curb and combination curb and gutter slope transitions adjacent to the curb ramp are included in the payment for curb and combination curb and gutter in Section 502 of the Specifications and are not included in this pay item.

Removal and disposal of existing sidewalk, curb ramp, curb and combination curb and gutter will be measured for separate payment in Section 510 of the Specifications and are not included in this pay item.

**Curb Ramp with Detectable Warning Surface, Surface Mounted** will be measured in square yards of finished surface and detectable warning surface, complete-in-place, and paid for at the contract unit price per square yard. This price shall be full compensation for furnishing and installing a curb ramp with the approved surface mounted detectable warning (truncated domes) surface tile, including but not limited to, layout, excavation, bedding, concrete and/or brick pavers or concrete pavers, detectable warning surface tile, integral visual contrast, saw-cutting, dowels or other anchorage devices, bars, fasteners, adhesives, surface sealants, repairs and cleaning of adjoining areas disturbed by the installation, and all other labor, tools, equipment, materials and incidentals necessary to complete the work. The curb ramp shall be measured and paid by the type of surface material (concrete, and/or concrete pavers or brick pavers) and the surface mounted detectable warning surface application. Brick pavers and concrete pavers shall include the cost of the brick pavers and concrete pavers, bedding materials, handling, installation and any other incidental work required to complete the curb ramps. The quantities of the concrete and/or brick pavers or concrete pavers and detectable warning surface shall be computed as the actual quantity of the material installed in place.

Curb and combination curb and gutter slope transitions adjacent to the curb ramp are included in the payment for curb and combination curb and gutter in Section 502 of the Specifications and are not included in this pay item.

Removal and disposal of existing sidewalk, curb ramp, curb and combination curb and gutter will be measured for separate payment in Section 510 of the Specifications and are not included in this pay item.

**Installation of Detectable Warning Surface, Surface Mounted, to an Existing Curb Ramp** will be measured in square feet of detectable warning surface, complete-in-place, and paid for at the contract unit price per square feet. This price shall be full compensation for furnishing and installing the approved surface mounted detectable warning (truncated domes) surface tile, including but not limited to, detectable warning surface tile, integral visual contrast, saw-cutting, fasteners or other
anchorage devices, adhesive, surface sealants, repairs and cleaning of adjoining areas disturbed by the installation, and all other labor, tools, equipment, materials and incidentals necessary to complete the work. The quantities of the detectable warning surface shall be computed as the actual quantity of material installed in place.

502.04 - Measurement and Payment - *add the following pay items:*

<table>
<thead>
<tr>
<th>Pay Items</th>
<th>Pay Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curb Ramp (type of material) with Detectable Warning Surface, Cast-In-Place</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Curb Ramp (type of material) with Detectable Warning Surface, Surface Mounted</td>
<td>Square Yard</td>
</tr>
<tr>
<td>Installation of Detectable Warning Surface, Surface Mounted, to an Existing Curb Ramp</td>
<td>Square Yard</td>
</tr>
</tbody>
</table>

**SECTION 503 – CONTRACTOR BOUNDARY SURVEYING**

503.01 – Description – *add the following:*

**Permanent Survey Monuments** – This work shall consist of furnishing all material, equipment, tools and labor necessary for the cast-in-place or precast permanent survey monuments at location(s) specified in the contract documents or as directed by the Owner. All monuments shall be installed by a Land Surveyor, licensed in the Commonwealth of Virginia, as required by the Department of Professional and Occupational Regulation – Rules and Regulations – 18 VAC 10-20-370 C-4.

503.02 – Materials – *replaces with the following paragraph*

Right-of-way monuments and permanent survey monuments shall conform to Section 219.

503.03 – Procedures – *add the following:*

(e) **Permanent Survey Monuments:** The Contractor shall furnish and install permanent survey monuments in accordance with the detail or standards shown in the contract documents and the current Public Works Specifications and Standards, Appendix C, Miscellaneous Standard Drawings, Detail C-15, Permanent Survey Monument.

Permanent Survey Monuments will be constructed of precast Class A-3 concrete, 30” in length and either 6” square or 6” in diameter, having a number (5) deformed reinforcing bar imbedded therein; or the monument may be a number five (5) deformed reinforcing bar a minimum of 30” long with Class A-3 concrete poured in place around the bar 30” deep, and a minimum of 6” in diameter, marking the point represented on the final plat. The initials and number of the surveyor who has endorsed the recorded plat will be imprinted in the concrete at the top of the monument around the pin.
**503.04 – Measurement and Payment** – add the following pay item for payment:

**Permanent survey monument** will be measured in each either precast or cast-in-place, complete-in-place, and paid for at the contract unit price per each. This price shall be full compensation for furnishing and installing a permanent survey monument including, but not limited to, survey, computations, field work, layout, excavation, Class A-3 concrete, number 5 deformed reinforcing bar and cleaning of adjoining area disturbed by the installation, and all other labor, tools, equipment, materials and incidentals necessary to complete the work.

**503.04 - Measurement and Payment** – add the following pay item

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent survey monument</td>
<td>Each</td>
</tr>
</tbody>
</table>

**SECTION 504 - SIDEWALKS, STEPS AND HANDRAILS**

**504.03 - Procedures** - is amended as follows:

(d)CG-12 Detectable Warning Surface: – is deleted

**504.04 – Measurement and Payment** - is amended as follows:

CG-12 Detectable Warning Surface – is deleted

**SECTION 505—GUARDRAIL AND W-BEAM MEDIAN BARRIERS**

**505.03 – Procedures** - replaces the sixteenth paragraph with the following

The Contractor shall submit two copies of the manufacturers’ recommended installation instructions and the FHWA NCHRP 350 or MASH approval letter for the type of new or salvaged guardrail end treatments being installed on the project to the Owner at least 2 weeks before starting guardrail end terminal installation. All end terminals shall be from manufacturers on the VDOT Materials Division’s Approved Products List 12 and the VDOT NCHRP 350 or MASH approved list linked in List 12. New Type I Re-Directive Impact Attenuators and Guardrail Terminals shall be permanently identified by stamping or engraving in a location readily visible for inspection that is not susceptible to damage. The identification shall include Manufacturer, Date and Site of Manufacture, and Model Number.

**505.03 – Procedures** – is amended as follow

(d) Adjusting existing guardrail: - replaces the first paragraph with the following

Adjusting existing guardrail beam shall consist of removing and disassembling the existing guardrail beam and offset blocks from the posts, drilling the post in
accordance with the standard drawing, and reassembling the offset blocks and guardrail beam to the height required by current Standard Drawings or Specifications. Adjusting the existing guardrail beam shall be limited to 4”. Adjusting guardrail beam shall be limited to steel posts and shall be in accordance with the plan details and Standard Drawings. Adjusting existing guardrail beam will not be permitted within the pay limits of end terminals. The terminal shall be completely removed and reinstalled or a new terminal installed in accordance with the Standard Drawings and the manufacturer’s instructions.

Adjusting existing guardrail to meet the GR-MGS1 or GR-MGS1A Standard Drawings will not be permitted.

505.04 – Measurement and Payment - replaces the fifth paragraph with the following

Terminal treatment or end anchorage for beam guardrail, cable guardrail, and steel median barriers terminating on the roadway side of the ditch line will be measured in units of each and will be paid for at the contract unit price per each.

505.04 – Measurement and Payment – add the paragraph with the following for payment

Guardrail height transition (Standard) will be measured in units of each and will be paid for at the Contract each price. This price shall include furnishing and placing posts, offset blocks, and all hardware necessary to fully install the height transition.

505.04 – Measurement and Payment – add the following pay items

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guardrail end anchorage (Standard)</td>
<td>Each</td>
</tr>
<tr>
<td>Guardrail height transition (Standard)</td>
<td>Each</td>
</tr>
</tbody>
</table>

SECTION 508 - DEMOLITION OF PAVEMENT AND OBSCURING ROADWAY

508.03 - Measurement and Payment – is amended as follows:

Demolition of hydraulic cement concrete pavement and shoulder structure courses or a combination thereof: replaces with the following paragraphs

Demolition of hydraulic cement concrete pavement and shoulder structure courses or a combination thereof: will be measured in square yards from edge of pavement to edge of pavement. This price shall include performing all demolition, removing and disposing of pavement, base, subbase, and stabilized subgrade materials.

No separate measurement for saw cutting associated with pavement demolition or curb removal will be made.
All demolition is to include the removal and disposal of surplus material not used in obscuring and includes the top 12” of material below the existing pavement.

Demolition of asphalt concrete pavement and shoulder structure courses or a combination thereof: replaces with the following paragraphs

Demolition of asphalt concrete pavement and shoulder structure courses or a combination thereof: will be measured in square yards from edge of pavement to edge of pavement. This price shall include performing all demolition, removing and disposing of pavement, base, subbase, and stabilized subgrade materials.

No separate measurement for saw cutting associated with pavement demolition or curb removal will be made.

All demolition is to include the removal and disposal of surplus material not used in obscuring and includes the top 12” of material below the existing pavement.

Demolition of a combination of hydraulic cement concrete pavement and asphalt concrete pavement and shoulder structure courses or a combination thereof: replaces with the following paragraphs

Demolition of a combination of hydraulic cement concrete pavement and asphalt concrete pavement and shoulder structure courses or a combination thereof: will be measured in square yards from edge of pavement to edge of pavement. This price shall include performing all demolition, removing and disposing of pavement, base, subbase, and stabilized subgrade materials.

No separate measurement for saw cutting associated with pavement demolition or curb removal will be made.

All demolition is to include the removal and disposal of surplus material not used in obscuring and includes the top 12” of material below the existing pavement.

SECTION 509 – FLOWABLE BACKFILL PLACEMENT

509.03 – Procedures – add the following paragraphs

Flowable backfill or any other backfill of non-neutral pH shall not be used near any metal pipe.

Flowable backfill shall have a design compressive strength of 30 to 200 psi at 28 days when tested in accordance with AASHTO T-23. Mixture design shall result in a fluid product having an 8” to 10” slump at time of placement. The Contractor shall submit a mixture design for approval supported by laboratory test data verifying compliance with 28 day compressive strength requirements. Mix design shall be approved by the Owner prior to placement.
SECTION 510 - RELOCATING OR MODIFYING EXISTING MISCELLANEOUS ITEMS

510.01 - Description - replaces with the following paragraph

This work shall consist of removing, salvaging, disposing, resetting, relaying, adjusting, installing, modifying, reconstructing, or relocating existing items or items furnished by the Owner, or others including, but not limited to right-of-way monuments, guardrail, rip rap, curb & gutter and curb, driveway entrance, median, sidewalk, drainage structures, traffic control devices, signalization equipment, water or sewer facilities and other items designated on the plans or elsewhere in the Contract.

510.04 - Measurement and Payment - add disposing after the word "Removing".

SECTION 512 - MAINTAINING TRAFFIC

512.01 - Description – replaces with the following paragraphs

This work shall consist of maintaining traffic and protecting workers through temporary work areas, maintaining public and private entrances and mailbox turnouts, constructing and obliterating temporary traffic diversions, providing positive guidance to the traveling public and pedestrians within the limits of the work area and over approved traffic Detours. All work shall be in accordance with the VWAPM, the MUTCD, and the Contract, as directed by the Owner.

512.02 - Materials - is amended as follows

(f) Temporary (Construction) signs - replaces with the following paragraphs

Temporary (Construction) signs for traffic control during construction, maintenance, permits, utility, and incident management activities shall have retroreflective sign sheeting in accordance with Sections 247 and 701 of the Specifications, and shall be installed in accordance with Section 701 of the Specifications.

Sign substrates for rigid temporary (construction) signs mounted on posts and temporary (construction) sign panels for overlays shall be either fabricated of aluminum at least 0.080” inches thick, conforming to Section 229.02(a) of the Specifications, or one of the following from the VDOT Traffic Engineering Division’s Approved Products List: 0.4” thick corrugated polypropylene; 0.4” thick corrugated polyethylene plastic; or 0.079” thick aluminum/plastic laminate. Sign substrates shall be smooth, flat, and free of metal burrs or splinters.

Sign substrate materials for signs mounted on drums, Type 3 barricades, and portable sign stands shall be as specified below and shall be the same material that was used when the device was tested and found to be in compliance with the
requirements of National Cooperative Highway Research Program (NCHRP) Report 350, Test Level 3, or of other materials allowed in the FHWA acceptance letter. Drums, Type 3 barricades, and portable sign stands shall be from VDOT’s Location & Design Division’s NCHRP 350/MASH Approved Products List.

**Sign Substrates for Type 3 Barricades and Portable Sign Stands**

<table>
<thead>
<tr>
<th>Rollup sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4 inch thick corrugated polypropylene or polyethylene plastic</td>
</tr>
<tr>
<td>0.079 inch thick aluminum/plastic laminate</td>
</tr>
</tbody>
</table>

**Sign Substrates for Drums**

| 0.4 inch thick corrugated polypropylene or polyethylene plastic |

(h) **Remote Solar Powered Portable Changeable Message Signs (RSPPCMS)** – add the following paragraphs

Remote Solar Powered Portable Changeable Message Signs (RSPPCMS) units shall be self-contained, with LED message board, a battery pack power supply with solar panel array to recharge the battery pack, cellular phone with modem and IBM compatible software package, onboard microprocessor sign message controller, and trailer. The trailer and sign frame shall be painted Virginia Highway Orange or equivalent color. The sign panel support shall provide for an acceptable roadway viewing height which shall be not less than 7 feet from the bottom of sign to crown of road.

RSPPCMS units shall have message panels that provide for 3 lines of text capable of displaying up to 11 characters per line, in a full-matrix or half-matrix format. The message shall be capable of being composed from both a local keyboard and a separate laptop computer (via cell phone). The message shall be legible in any lighting condition. Both units shall be capable of sequentially flashing at least 3 messages of 3 lines each with appropriate controls for selection of messages and variable off-on time. Motorists should be able to read the entire PCMS message twice while traveling at posted speed.

512.03 - Procedures – replaces the seventh paragraph with the following

The color of Automated Flagger Assistance Device trailers, arrow board trailers, portable traffic control signal trailers, Intelligent Traffic Systems (ITS) trailer equipment, and portable changeable message sign trailers and sign frames shall be either Virginia highway orange (DuPont Color No. LF74279 AT or color equivalent) or federal yellow. The back traffic facing trailer frame, where the signal and brake lights are located, shall be fully covered with 2” high retroreflective sheeting conforming to Section 247.02(c) of the Specifications. The sheeting shall have alternating 11” wide vertical red stripes and 7” wide vertical white stripes.
512.03 - Procedures - is amended as follows

(a) **Temporary (Construction) Signs:** – *add the following to the third paragraph*

The Contractor shall relocate all street name signs, no parking signs and other regulatory, warning and guide signs, within the construction limits which conflict with construction work, as approved by the Owner. Any such signs which are not needed for the safe and orderly control of traffic during construction, as determined by the Owner, shall be removed and stored at a designated location within the project limits. The removed signs shall be stored above ground in such a manner as to preclude damage and shall be reinstalled in their permanent location(s) prior to final acceptance of the project. In the event any of the removed signs are not to be reinstalled, the Contractor shall notify the Owner at the time the signs have been properly removed and stored, and such signs will be removed from the project limits by the Contractor and returned to the City of Virginia Beach Traffic Operation Bureau located at 3556 Dam Neck Road in Virginia Beach. Any sign which is damaged or lost due to the fault of the Contractor shall be replaced at the Contractor's expense. All cost for removing, storing, protecting, and reinstalling such signs shall be included in the price bid for other items in the Contract, and no additional compensation will be made.

(a) **Temporary (Construction) Signs** – *add the following paragraphs*

When permitted by the Owner, the Contractor may furnish portable stands for mounting the temporary sign panels. Portable stands shall accommodate signs of all standard shapes, including octagonal and triangular and have a flag holder which will accommodate three flags as an integral part of the unit. The portable stand shall have adjustable legs capable of adjusting to uneven surfaces. While supporting a 20 square foot rigid sign panel, the stand shall withstand 50 MPH winds without tipping over or rotating more than ±5 degrees about its vertical axis without the use of tie downs or ballast of any kind. The complete unit shall not exceed 40 pounds.

Flexible sign base material will be permitted for use during: 1) any planned day time operation or work zone that will be set up and taken down on a daily basis, 2) any unplanned night time emergency situation of incident management, or 3) any planned operation or work zone that will not exceed more than three (3) consecutive working days (planned work exceeding three (3) working days, aluminum sign panels will be used on ground mounted sign posts).

(b) **Flagger Services:** - *add the following paragraphs*

**Flagger Services:** Certified flaggers shall be provided in sufficient number and locations as necessary for control and protection of vehicular and pedestrian traffic in accordance with the VWAPM. Flaggers shall be able to communicate to the traveling public in English while performing the job duty as a flagger at the flagger station. Flaggers shall use sign paddles to regulate in accordance with the VWAPM.
Certification for flaggers will be awarded upon a candidate’s satisfactory completion of an examination. Certification cards shall be carried by flaggers while performing flagging duties. Flaggers found not to be in possession of their certification card shall be removed from the flagging site and operations requiring flagging will be suspended by the Owner until a certified flagger is on-site to perform flagging duties in accordance with the requirement herein. Further, flaggers performing duties improperly will have their certifications revoked.

When traffic control flagging is required at a signalized intersection within the project limits, the flagger shall be an off duty City of Virginia Beach police officer.

(g) Channelizing Devices:

2. Drums/cones within auxiliary device attached, and portable vertical panel assemblies with or without an auxiliary device attached: - is amended as follow

b. Group 2 Devices – is amended as follow

1) Drums – replaces the third paragraph with the following

Drums shall be used in all unmanned work zone locations and shall also be used to delineate the locations of all non-crashworthy trailer mounted devices such as, but not limited to, ITS devices, Portable Changeable Message Sign, Highway Advisory Radio, Speed Trailers, CB Wizards, etc. as well as light towers. Drums shall be used to delineate merging tapers on limited access highways during nighttime operations and the location of Electronic Arrow Boards.

Portable Traffic Control Signals and AFAD units shall be delineated in accordance with the VWAPM.

(k) Temporary (Construction) Pavement Markings – add the following to the first paragraph

Type B, Class II thermoplastic material may also be used for construction pavement markings if required by the plans or directed by the Owner.

The Contractor shall contain eradication residue and have engineering controls in place, such as vacuum assisted methods, in compliance with the Occupational Safety and Health Administration’s standards as detailed in 29 CFR 1926.62, 1926.103 and 1910.94.

When markings are required to be removed, 100% of the marking shall be removed.
Type E black construction pavement marking may be used to cover existing markings in lieu of eradication methods on asphalt concrete surfaces when its use will not be required for more than 120 days. When Type E construction pavement markings are specified as a pay item, the Contractor shall use this material to cover markings as indicated in the plans or as directed by the Owner. Type E construction pavement marking shall be applied in accordance with the manufacturer's recommendations.

(l) **Eradicating Pavement Markings** - replaces the fourth paragraph with the following

The Contractor may submit other methods of eradication for the Owner’s approval. The Contractor shall minimize roadway surface damage when performing the eradication. The Contractor shall repair the pavement if eradication of pavement markings results in damage to or deterioration of the roadway presenting unsafe conditions for motorcyclists, bicyclists, or other road users. Pavement repair, when required, shall be performed using a method approved by the Owner.

(m) **Temporary Pavement Markers:** - replaces with the first paragraph with the following

Temporary Pavement Markers: Temporary pavement markers shall be installed with all temporary construction pavement markings in areas of work zones which will encroach upon the traveled roadway for a period of more than two days and in other areas as required by the Owner. Temporary pavement markers shall not be required on Type E removable markings or Type D, Class III removable markings.

512.03 - Procedures - add the following paragraphs

(y) **Temporary Pavement:** Temporary pavement shall be provided in accordance with the temporary pavement section detail shown on the plans. Temporary pavement shall be placed as shown on the plans or as directed by the Owner.

(z) **Pavement Patch:** Pavement patch shall be provided where indicated on plans or as directed by the Owner. Pavement patch section shall be provided in accordance with the pavement patch detail shown on the plans.

(aa) **Traffic Control Plans:** The Owner has made an attempt to furnish a typical traffic control details or plans as part of the Contract Documents. The Contractor may revise this traffic control plan to best suit conditions in the field and submit the revised plan to the Owner for approval. The Contractor shall also submit a maintenance of traffic plan showing the sequence of construction through the construction and work zone area. The traffic control plan and maintenance of traffic plan shall show the type of warning signs, barricades, channelizing devices, etc., and their placement and where flaggers, if necessary will be stationed. These plans shall be submitted at least fourteen (14) working days prior to the time the Contractor
intends to begin work. The Contractor shall not begin any work which will interfere with traffic until such time as it has an approved traffic plan in its possession. The Contractor may be required by the Owner to modify its plan as the work progresses.

The traffic control plans shall be in accordance with the VDOT’s Virginia Work Area Protection Manual and the MUTCD.

(bb) **Temporary Road and Street Closure:** Temporary road and street closure may be as directed on the plans or used with the approval of the Owner. The Contractor may request from the Owner that a road or street be temporarily closed to accommodate construction activities, improvements or installations. All requests for temporary road closures shall be forwarded in writing to Public Works, Traffic Engineering within fourteen (14) working days prior to the anticipated closure for review and approval as described in the Virginia Beach City Code, Article II. “Work On, Over, Under, or Affecting Streets”. A road closure request shall contain the following: Project name and number, a statement as to the necessity for the road closure, the start and end dates of the road closure, a traffic control detour plan showing the proposed alternate detour route(s) and all necessary traffic control devices such as signs and barricades. The Contractor shall not close a road or street until such time he has written approval from the Owner. The Contractor shall keep a copy of the written approval and a copy of the approved traffic control plan on site while work is being completed, and shall make these copies readily available for review by the Owner. The Contractor should submit his schedule of any anticipated road closures as the pre-construction meeting.

The Contractor shall furnish, erect and remove all signing, markings and barricades as called out on the approved traffic control detour plan. The providing of such detours, and the marking of alternate routes shall not be construed as relieving the Contractor of its responsibilities for the safety of the public using the project or from any provisions of the construction plans affecting the right of the public hereunder, including lights and barricades as herein set forth. The use of all temporary road closures, whether furnished in accordance with the Contract Documents, or established by the Owner, shall be discontinued as directed.

Public Works Traffic Engineering Division is responsible for coordinating all road and street closure requests.

A temporary road or street closure may be requested by the Contractor for the purpose of construction, maintenance, and repair on any City of Virginia Beach road or street. Specific conditions, warrants or operations will determine if a road or street closure is warranted.

In general, detouring of arterial traffic onto residential roads will not be approved. Residential streets will only be used as detour routes as a last resort.

When requesting a temporary road closure, the Contractor will submit the following:
1. **Traffic Maintenance and Control Plan (TMCP)** showing the proposed road or street closure and detour limits. The TMCP plan must show various types and placement locations of signs, channelizing devices, barricades and when required, Portable Changeable Messages Signs (PCMS) to safely and properly close a road or street. This requirement is described in the Virginia Beach Code, Article II. "Work On, Over, Under, or Affecting Streets".

All traffic control devices required on the TMCP will need to conform to the latest requirements of the Manual on Uniform Traffic Control Devices, a publication by the Federal Highway Administration, and the latest VDOT’s Work Area Protection Manual.

Written statement containing the following information:

a. Name, address, phone, cell phone & fax numbers of person(s) or group(s) requesting the temporary closure.

b. A name list with appropriate phone & cell phone numbers of those who will be responsible for overseeing and who will be responsible for maintaining the temporary closure.

c. Project name, number or title.

d. Type of work being performed.

e. Limits of the temporary closure.

f. Description of proposed detour route, if different from the work zone.

g. Date temporary closure and detour will begin.

h. Date temporary closure and detour will end.

i. A copy of the door-to-door notice to be given out to affected residents and business prior to temporary closure.

j. A statement as to the necessity for the road closure, i.e., water repairs, maintenance, road construction.

k. When required by the City of Virginia Beach Traffic Engineer Division, an informational map suitable for public notification of the road and street closure limits and detour route.

Public Works, Traffic Engineering Division will review the temporary road or street closure request. If acceptable, Traffic Engineering Division will
forward an approval notice and the approved TMCP to the Contractor giving them permission to temporarily close a road or street.

If the request and TMCP are not acceptable, Traffic Engineering will notify the Contractor of denial, and/or make recommendations or revisions necessary to correct the TMCP. Once the TMCP has been corrected, the Contractor must then resubmit the TMCP for approval.

2. **Road Closure Time Extensions:** Any requested time extensions to an existing road or street closure must be requested in writing (when possible) five (5) working days prior to the expiration of a temporary closure and detour, and will include an explanation as to why the additional time is needed.

The Contractor will ensure that the road or street has been properly closed according to the approved TMCP and that all safety measures have been taken to protect the work zone and surrounding area.

The Contractor will notify all local residents and businesses of the proposed closure and detour by means of distributing door to door notices a minimum 48 hours prior to the temporary closure and detour. A copy of the notice will be forwarded to Traffic Engineering Division.

The Contractor will notify any local Civic League one week prior to the temporary closure and detour. Civic League contacts and addresses can be obtained by contacting the Public Information Office at (757) 385 - 4111.

The Contractor will maintain local resident, business, and emergency access at all times throughout the duration of the temporary closure and detour.

The Contractor will provide, install, maintain, and remove all traffic control signing, channelizing devices, and barricades as specified on the approved road closure TMCP.

The Contractor will have on site at all times the temporary closure approval notice and the approved road closure TMCP.

3. **Public Notification:** At the discretion of Traffic Engineering Division, additional requirements for advertising may be required. The following will also be required:

The Contractor will be responsible for providing and installing Public Notice signs and DMS a minimum seven (7) days prior to the temporary closure and detour. The sign messages will be provided by Traffic Engineering Division.
The following information shall be a specific requirement when a road or street closure has been approved by the Owner: The Contractor shall;

a. Maintain resident and emergency vehicle access at all times throughout the project. Maintain access for vehicles occupying handicapped persons, this will also include access for school busses occupied by handicapped patrons.

b. Provide 48-hour notice to all affected residents prior to closure by means of distributing door-to-door notices.

c. Install, maintain, and remove all traffic control signing and channelizing devices as noted on the approved traffic control plan.

(dd) **Remote Solar Powered Portable Changeable Message Signs (RSPPCMS):** The Contractor shall determine from its plan of operations or working schedule the most efficient and effective use of the RSPPCMS units based on its construction sequencing or traffic control operations. RSPPCMS signs shall be periodically checked by the Contractor for compliance with manufacturer’s requirements for operation and functions, and shall be ready for immediate used once employed on the project.

During emergency situations, the Contractor shall make every effort to deploy units it has assigned to the project. However, if the number of units shown on the plans are already in operation and cannot be reassigned to handle the emergency situation, then the Contractor shall immediately contact the Owner. The Owner will then make a determination as to the most expeditious manner in which to deploy units for emergency used, whether by using Owner supplied units, directly the Contractor to reassign those units he has committed to the project, or having the Contractor supply additional units as may be necessary. In these circumstances, the cost of such additional units that are authorized by the Owner shall be in accordance with the requirements of Section 109.05.

If the use of the additional units beyond the number of those identified in the plans is required due to reasons attributable to the Contractor or his manner of operations as determined by the Owner, and no units are available, the Contractor shall furnish such additional unit(s) to the project within two hours of the Owner’s request or the Owner will move to provide such units as necessary and deduct the cost from any monies due the Contractor. This action shall in no way relieve the Contractor of the responsibility for controlling, maintaining, and completing the work.

512.04 - Measurement and Payment - *is amended as follow*

**Electronic arrow board** - *replaces with the following paragraph*
Electronic arrow board will be measured in each unit of actual use as shown in the plans or directed by the Owner. Electronic arrow board will be paid for at the contract unit price per each/hour, each/day, each/week, each/month. This price shall be full compensation for furnishing, maintaining, operating and repositioning of each unit. This price shall include arrow panels, fuel, maintenance and a truck or trailer having flashing amber warning lights.

**Group 2 channelizing devices - replaces with the following paragraph**

**Group 2 channelizing devices** as required by the Owner will be measured in each device per day of actual use and will be paid for at the contract unit price per each/day. This price shall include maintaining and removing devices when no longer required, and signs. When Group 2 channelizing devices are moved to a new location or are removed and reinstalled at the same location, they will be measured for separate payment as approved by the Owner. However, when the Group 2 channelizing devices are moved from one lane to another by simply moving the devices across the lane edge line without a planned or authorized removal from the roadway, no additional payment will be made.

**Temporary traffic control signal - replaces with the following paragraph**

**Temporary traffic control signal** will be paid for at the contract lump sum price for the location specified in the contract documents. This price shall include, but not be limited to, supports; span wire; tether wire; conduit; conductor cable; traffic signal heads; back plates; hanger assemblies; necessary control items; vehicle detection; uninterruptable power supply; channelizing devices; and, when approved, portable traffic control signal equipment. The price shall also include installing, maintaining, adjusting, and aligning signal equipment; when required plan development, inclusive of signal layout, signal timing, phasing, and/or sequencing; providing electrical service; utility company costs; and removing temporary signal equipment when no longer required.

**Temporary (Construction) pavement message markings - replaces with the following paragraph**

**Temporary (Construction) pavement message markings** (Word, size character, type or class material) will be measured in units of each character for the height specified and for type or class material specified and will be paid for at the contract unit price per each character. This price shall include surface preparation, premarking, furnishing, installing, quality control tests, daily log, guarding devices, primer or adhesive, glass beads, reflective optics materials (when required), and warranty.

**Eradication of existing pavement markings - replaces with the following paragraphs**

**Eradication of existing linear pavement markings** will be measured in linear feet of a 4” width to 24” width. Widths that exceed a 24” increment by more than ½” will be measured as the next 24” increment. Measurement and payment for eradication of existing pavement markings specified herein shall be limited to linear pavement line markings. Eradication of existing pavement markings will be paid for at the contract unit price per linear foot. This price shall include removing
pavement line markings, testing of residue, cleanup and disposing of residue. When the use of Type E construction pavement markings for covering existing pavement markings is not required by a pay item and its use is allowed by the specifications, the price for the marking material, preparing the surface, adhesive, and maintaining and removing Type E markings when no longer required shall be included in this pay item.

**Eradication of existing nonlinear pavement markings** - replaces with the following paragraph

**Eradication of existing nonlinear pavement markings** will be measured in units of each and will be paid for at the contract unit price per each. Nonlinear pavement markings shall include but not be limited to arrows, images, symbols and messages. This price shall include removing nonlinear pavement markings, testing of residue, cleanup, and disposal of nonhazardous residue.

**Type 3, barricades** - replace the last 2 sentences with the following:

The price shall include the barricades, retroreflective sheeting, sandbags, relocating to new locations and removing the barricades when no longer required. When Type 3 barricades are moved to a new location, as directed by the Owner, the relocated barricade will be measured for separate payment.

**Temporary (Construction) signs** - replaces with the following paragraphs

**Temporary (Construction) signs** will be measured in each sign per day of actual use for long term stationary temporary traffic control zone as defined in the plans or VDOT’s Work Area Protection Manual. Temporary construction signs will be paid for at the contract unit price for each sign per day. This price shall include fabricating, furnishing, and installing, maintaining, covering, uncovering, relocating, removing, and storing sign panels, reflective sheeting, framing members, sign panel bracing, sign messages, delineators, flags, hardware, posts, portable stands or other signs supports and flags, and final removal when no longer required and all materials, labor and equipment necessary to complete the work.

Temporary (construction) signs, portable sign supports and weights, and vehicles mounted signs, their supports and mounting hardware used for intermediate term, short-term, short duration and mobile work operations, as define in the VWAPM will not be measured for payment; all costs for providing such signs be included with other items of work. Covering, uncovering, or removing and reinstalling existing signs which conflict with the signs needed for maintenance of traffic will also not be measured for separate payment. The cost thereof shall be included in the price for other appropriate pay items.

**Portable changeable message sign (PCMS)** - replaces with the following paragraphs

**Portable changeable message sign (PCMS)** will be measured in each unit of actual use and will be paid for at the contract unit price per each/day, each/week or each/month for the type specified, which shall be full compensation for furnishing, maintenance, operation and repositioning the unit.

**512.04 - Measurement and Payment** - add the following pay items
Temporary (Construction) Pavement symbol markings (Symbol, type or class material) will be measured in units of each per location for the symbol and type or class material specified and will be paid for at the contract unit price per each symbol. This price shall include surface preparation, premarking, furnishing, installing, quality control tests, daily log, guarding devices, primer or adhesive, glass beads, reflective optics materials when required, and warranty.

**Police assisted flagger service** will be measured in hours as authorized or approved by the Owner except when used for the Contractor’s convenience. Police assisted flagger service will be paid for at the contract unit price per hour. This price shall include all safety equipment needed to perform the flagging duty.

**Pavement patch** will be measured in square yards. Pavement patch will be paid for at the contract bid price per square yard based on the pavement patch section shown in the bid document. This price shall include all labor, materials and equipment necessary to complete the work.

**Temporary pavement** will be measured in square yards. Temporary Pavement will be paid for at the contract bid price per square yard based on the temporary pavement section shown in the bid document. This price shall include preparing the subbase, placing, installing, maintaining, and final removal and disposal of temporary pavement when no longer required and all materials, labor, and equipment necessary to complete the work.

**Remote solar power portable changeable message sign (RSPPCMS)** will be measured in each unit of actual use and will be paid for at the contract unit price per each/day, each/week or each/month for the type specified, which shall be full compensation for furnishing, maintenance, operation and repositioning the unit.

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

**512.04 - Measurement and Payment** – amended and add the following pay items

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
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<tbody>
<tr>
<td>Electronic arrow board</td>
<td>Ea./hour, Ea./day, Ea./week,</td>
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<tr>
<td></td>
<td>Ea./month</td>
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<tr>
<td>Group 2 channelizing devices</td>
<td>Ea./day</td>
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<tr>
<td>Temporary traffic control signal</td>
<td>Lump Sum</td>
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<tr>
<td>Temporary (Construction) pavement message marking (Word, size character, type or class material)</td>
<td>Each</td>
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<tr>
<td>Eradication of existing linear pavement markings</td>
<td>Linear foot</td>
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<tr>
<td>Eradication of existing nonlinear pavement markings</td>
<td>Each</td>
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<tr>
<td>Type 3, barricades (Width)</td>
<td>Each</td>
</tr>
<tr>
<td>Temporary (Construction) sign</td>
<td>Each/day</td>
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<tr>
<td>Temporary (Construction) pavement symbol marking (Symbol, type or class material)</td>
<td>Each</td>
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<tr>
<td>Police assisted flagger service</td>
<td>Hour</td>
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<tr>
<td>Pavement patch (depth &amp; type of asphalt)</td>
<td>Square yard</td>
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<tr>
<td>Temporary pavement (depth &amp; type of asphalt)</td>
<td>Square yard</td>
</tr>
<tr>
<td>Portable changeable message sign (PCMS)</td>
<td>Ea./day, Ea./week, Ea./month</td>
</tr>
<tr>
<td>Remote solar powered portable changeable message (RSPPCM)</td>
<td>Ea./day, Ea./week, Ea./month</td>
</tr>
<tr>
<td>Temporary (Construction) Pavement symbol markings</td>
<td>Each</td>
</tr>
</tbody>
</table>

SECTION 514 - FIELD OFFICE

514.02 - Procedures – add the following to the first paragraph

The Contractor shall supply electrical services, telephone services and a dedicated high speed computer internet connection as approved by the Owner.

514.02 - Procedures - is amended as follows

Type III Field Office – add the following paragraph

Type III Field Office: 1 Copy machine capable of copying 8 ½” x 11”, 8 ½” x 14” and 11” x 17” sized original
1 Fax machine

(g) Toilets - replaces with the following paragraphs

Toilets shall conform to the requirements of the state and local boards of health or other bodies or courts having jurisdiction in the area. Toilet facilities shall be inside the Field Office. Facilities shall have a positive functional lock on the inside of the doors.

The When the Contractor provides toilet facilities inside the Field Office, the toilet facilities shall have a continuous supply of water at a flow rate of not less than five gallons per minute. The toilet facilities shall be connected to either a sewer line or a permitted sewage holding tank with sewage pumping at a frequency that prevents overflow and backups.

The toilet The Contractor shall supply one (1) dedicated high speed computer internet connection. All costs associated with the installation, monthly charge and disconnection of the high speed computer internet connection will be paid by the Contractor as part of the price for the Field Office

Contractor shall provide washing facilities in accordance with VOSH regulations.
i) Utilities - replaces with the following paragraphs

SECTION 515 – PLANING OR MILLING PAVEMENT

515.05 - Measurement and Payment: - is amend as follow

Flexible pavement planning – add the following paragraph

Flexible pavement planning will be measured in square yards of pavement surface designated on plans. Flexible pavement planning will be paid for at the contract unit price per square yard which price shall be full compensation for the planning operation, removal and disposal of existing pavement and debris, and for all materials, labor, tools equipment and incidentals necessary to complete the work. The Contractor shall supply all labor, equipment, and vehicles necessary for prompt and efficient removal of the removed pavement. The milled or planed surface shall be swept clean of all debris and foreign material.

Rigid pavement planning – add the following paragraph

Rigid pavement planning will be measured in square yards of pavement surface designated on plans. Rigid pavement planning will be paid for at the contract unit price per square yard which price shall be full compensation for the planning operation, removal and disposal of existing pavement and debris, and for all materials, labor, tools equipment and incidentals necessary to complete the work. The Contractor shall supply all labor, equipment, and vehicles necessary for prompt and efficient removal of the removed pavement. The milled or planed surface shall be swept clean of all debris and foreign material.

SECTION 516—DEMOLITION OF BUILDINGS AND CLEARING PARCELS

516.02 – Procedures - is amended as follow

(d) Demolition: - replaces the first paragraph with the following

The Owner will issue written notification to the Contractor when buildings are ready for demolition. Demolition shall include removing and disposing of materials from buildings and appurtenances down to ground level. If the structure includes a basement, concrete slab, or any other elements which extend below the ground, exclusive of piles, then demolition shall include removing and disposing of the materials down to, and including, this portion of the structure as directed by the Owner.

(e) Clearing Parcels: - replaces the second paragraph with the following

Clearing parcels shall include disposing of materials from abandoned, noncombustible foundations down to and including floor slabs, basement slabs, and any improvement or appurtenance designated for removal but not listed as a pay item. Foundations for
buildings designated as pay items will be considered part of those buildings, and removed according to paragraph (d) above. Combustible debris and rubble, including fences, posts, or pillars shall be removed from the right of way or from within the limits of easements obtained for removing buildings that may be partially outside the right of way.

SECTION 520 - WATER AND SANITARY SEWER FACILITIES
Replaces the entire section with the following

520.01 - Description

This work shall consist of furnishing all labor, material, equipment and supplies and the performance of all work necessary for the construction of new and the relocation and adjustment of the existing water systems, sanitary sewer systems and appurtenances as described herein and in conformity with the dimensions, lines, and grades, and limits shown on the construction plans. All items of material, labor, supplies or equipment that are not specifically enumerated for payment as separate items, but which are reasonably required to complete the work as shown on the construction plans and as described in the Contract Documents, are considered subsidiary obligations of the Contractor. No separate measurement or payment will be made for them. All deficiencies shall be corrected to the Owner's satisfaction by the Contractor at no additional cost to the Owner. All such costs shall be included in the unit price bid for such work.

Utility relocations and adjustments shall be made in the minimum time possible with minimum interruption of service. All interruptions in existing service shall be scheduled with and approved by the City of Virginia Beach Public Utilities Department prior to proceeding with the work. No interruption of water service or sanitary sewer service will be allowed after 3:00 pm on Fridays, weekends, or normal City of Virginia Beach holidays. Interruptions of water service will be preceded by a trial shutdown. The Contractor shall be responsible for installing a corporation stop and copper riser pipe for the trial shutdown if no hydrant is available (Section 520.05 - See Shutdowns for Connection to or Offsetting of Existing Utilities).

The Contractor shall notify the City of Virginia Beach, Department of Public Utilities, Inspection's Office at (757) 385-4171, at least 48 hours prior to performing any adjustments to or installation of any new water distribution lines, gravity or vacuum sanitary sewer lines, sanitary sewer force mains or appurtenances.

Sidewalks and streets shall be kept open for passage unless otherwise authorized by the Owner. The Contractor shall provide and maintain adequate and safe passage over excavations for the purpose of accommodating pedestrians or vehicles, as directed by the Owner.

The Contractor shall conduct all work in a safe and sanitary fashion. The Contractor shall not contaminate water lines; if such contamination occurs, the Contractor shall flush and disinfect such lines. The Contractor shall avoid all sewage spills. All sewage spills must be reported by calling (757) 385-1400 or 311 nights, weekends & holidays and immediately cleaned up. Disinfectant shall
be spread over the area of the spill. No sewage is to be discharged to or caused to be discharged to any groundwater, waterway, storm drain, ditch or similar feature.

Access to all in-service public and private fire hydrants within the project limits shall be maintained at all times. A minimum clear space of 10 feet radius around the hydrants shall be kept clear of all soil, stone, materials, equipment, and other obstructions. Deviations from this provision must be approved in advance by the Owner.

Restoration of property will not be measured separately and shall be considered incidental to other items unless otherwise specified in the contract.

If onsite material meets the requirements of Select Material, it shall be used and no additional payment shall be made.

520.02 - Materials

Items not currently accepted by the Owner must be submitted for review and approval by the Owner prior to incorporation into the work.

(a) **Ductile Iron Pipe:**


(b) **Concrete Blocks** shall conform to Section 222.

(c) **Bricks** shall conform to Section 222. Manhole brick shall meet requirements of ASTM C 32-1991 Grade MS "Sewer and Manhole from Clay or Shale."

(d) **Cement Mortar** shall conform to Section 218.

(e) **Concrete** shall conform to Section 217 and shall be Class A3, unless otherwise specified.

(f) **Reinforcing Steel** shall conform to Section 223 for size specified.

(g) **Curing Material for Concrete** shall conform to the applicable requirements of Section 220.
(h) **Non-Shrinking Waterproof Grout** shall conform to Section 218.

(i) **Pipe Bedding** shall consist of fine aggregate fill which shall conform to Section 202 - fine aggregate, grading A or coarse aggregate fill conforming to Section 203 - coarse aggregate, Size No. 57 or crushed concrete conforming to Section 203 with a pH range of 6.5 to 10.5.

(j) **Standard Ductile Iron Fittings** shall meet requirements of ANSI/AWWA C110/A21.10-93. Pressure rating shall be a minimum of 350 psi for fittings 24” and smaller and 250 psi for fittings 30” and larger. Fittings in sanitary sewer shall have 401 Protecto lining.

(k) **Compact Ductile Iron Fittings** shall meet requirements of ANSI/AWWA C153/A21.53-94. Pressure rating shall be a minimum of 350 psi for mechanical joint fittings 3” to 24”. Fittings in sanitary sewer shall have 401 Protecto lining.

(l) **Mechanical Joints and Jointing Materials** shall meet requirements of ANSI/AWWA C111/A21.11-95.

(m) **Restraint Systems** shall either be mechanical joint retainer gland or push-on restraint rubber gasket from the Department of Public Utilities Approved Product List. Piping within casings shall be mechanical joints with retainer glands.

(n) **Mechanical Joint Retainer Glands** shall be ductile iron and shall be on the Department of Public Utilities Approved Product List.

(o) **Pipe to Sleeve Sealant** shall be non-shrink grouting compound manufactured by 3M Company or be an equivalent product having strength properties of 80 psi tensile and 700 percent elongation in accordance with ASTM D 3574-81 test E, and linear dimension change shall not exceed 18 percent when subject to wet and dry cycles in accordance with ASTM D 756-78, G and D 1042-1978.

(p) **Push-on Joint and Rubber Gasket** shall meet requirements of ANSI/AWWA C111/A21.11-07.

(q) **Cement Mortar Lining with Bituminous Seal Coat for Ductile Iron Pipe and Fittings** for potable water shall meet requirements of ANSI/AWWA C104/A21.4-1995.


(s) **Exterior Bituminous Coating for Ductile Iron Pipe and Fittings** shall meet requirements of ANSI/AWWA C104/A21.4-1995.
(t) **Metal Tie Rod Restraints** shall be stainless steel threaded rods and fasteners (ASTM A 307) with stainless steel couplings (ASTM A 197) as detailed on the construction plans.

(u) **Gate Valves**

1. Gate valves shall be resilient seat with a non-rising stem (NRS) Gate valves 2” and larger shall meet requirements of ANSI/AWWA C509-1994. Valves shall be rated for at least 200 psi working pressure in sizes 3” through 12” and for at least 150 psi working pressure in sizes larger than 12” or pressure rating specified for adjacent piping, whichever is greater. Reduced wall valves shall meet requirements of ANSI/AWWA C515-99. Valve ends shall be compatible with piping systems in which valves are installed and restraint system to be used. Valves shall have O-ring seals. Valves to be used in the water system shall open clockwise. Valves to be on the Department of Public Utilities Approved Product List.

2. Tapping Valves - Shall meet requirements of gate valves specified above except that seat opening shall be larger than nominal size and valve outlet end shall have mechanical joint.

3. Ball Valves for Air Vent/Blow-off Assemblies - Shall be bronze Model M100 with stainless steel handle as manufactured by American Valve or approved equal.

(w) **Butterfly Valves** shall be used on water main piping 16” in diameter and larger unless otherwise specified. Butterfly valves shall meet requirements of ANSI/AWWA C504-1994. Valves shall be for the pressure class 150B and open clockwise. Wafer-type valves shall not be used underground. Valve bodies shall be constructed of close grain, high tensile strength ductile iron and coated inside and out with standard bitumastic coating for water mains. Valve body ends shall conform to the requirements of connecting pipe and restraint system to be used. The shaft shall have a minimum diameter specified for the size and class valve in Table 3 of AWWA C504. Discs shall be constructed of corrosion resistant alloy cast iron. Seats shall be natural or approved synthetic rubber of the molded type, secured for complete immobility under all operating conditions. Shaft bearing shall be self-lubricating sleeve type. Valves larger than 20” diameter shall have an adjustable two-way thrust bearing to keep the valve disc centered regardless of the valve position. Valves shall be on the Department of Public Utilities approved product list.
Valve operators shall be side-mounted and meet requirements of ANSI/AWWA C504-1994, pressure class 150B, and be capable of seating and unseating the discs against the full design pressure and velocity and shall transmit sufficient torque to the valve to accomplish this. Interior valves shall be the hand wheel type unless otherwise noted and open clockwise. Exterior valves for buried service shall have buried service gear actuated, permanently lubricated operators with 2” nut and open clockwise. Valve operators shall be suitable for a minimum of 10,000 cycles of operations at its rated torque. Valve operators shall be designed such that a maximum torque of 80 foot/pounds is required on the operator to develop the seating and unseating torques of the valve. Valve operators shall be sized based on valve diameter as indicated on the construction plans, materials specified above, and the following system characteristics:

Written certification of compliance with ANSI/AWWA C504-94, pressure class 150B, for each size valve and operator shall be required prior to installation. In addition, state the maximum operating torque, as defined in the appendix of AWWA C504-87, to which each size valve and its operator will be subjected based upon the above information and the torque output rating of each of the above operators. Butterfly valves shall not be used in the sanitary sewer force main system.

(x) **Valve Boxes** shall be adjustable cast iron valve boxes of the three piece type, consisting of lid, two piece sliding, and base. The valve box shall have a 5 ¼” shaft. Base shall be proper type and size for the valve with which it is used. The appropriate word "WATER" or "SEWER" shall be cast or embossed on the valve box lid in letters not less than 1” high. Valve boxes shall be on the Department of Public Utilities Approved Products List.

(y) **Water Valve Extension Stem** shall be Part No. A-26441 as manufactured by Mueller Company, or shop fabricated as shown on plan details.

(z) **Copper Piping** shall meet requirements of ASTM B 88-83, Type "K" soft drawn for below ground. Copper pipe shall be used for all waterlines 2” in diameter and smaller.

(z) **Corporation Stops, Meter Valves, and Service Couplings for 2-inch and Smaller Water Services** shall conform to requirements of AWWA C800-05 with the exception that any brass part of a fitting or coupling or valve in contact with potable water shall be made of a copper alloy CDA No. C89520 or a “no-lead brass” complying with ASTM B30 and B584. This “no-lead brass” alloy shall contain no more than one-fourth of one-percent (0.25% or less) total lead content by weight.

An ANSI accredited test lab per ANSI/NSF 61, Drinking Water Components-Health Effects Section 8, shall be used to certify the lead content for all “no-lead brass” fittings and valves. Proof of certification is required.
All brass fittings and couplings and valves shall have the manufacturers name or trademark integrally stamped or cast onto the fitting. Another marking identifying the item as a “no-lead brass” alloy shall be cast or stamped as well.

1. Corporation stops shall be on the Department of Public Utilities Approved Product List.

2. Meter valves shall be of the lock-wing type on the Department of Public Utilities Approved Product List.

3. Service couplings or unions shall be on the Department of Public Utilities Approved Product List.

4. For 1½” services, use double strap tapping saddles on the Department of Public Utilities Approved Product List with 1½” corporation stop (as per item 1 above), 1½” Type K copper service line and a flanged meter valve, as per Item 2 above with flanged tailpiece for meter connection.

5. For 2” services, use double strap tapping saddles shall be on the Department of Public Utilities Approved Product List with 2” corporation stop (as per item 1 above), 2” Type K copper services line and a flanged meter valve, as per Item 2 above with flanged tailpiece for meter connection.

6. For air vent/blow off assemblies, 2” corporation stops shall be bronze, have inside IP thread fittings and conform to AWWA C800-1984. The 2” corporation stops shall be on the Department of Public Utilities Approved Product List. Tapping saddles shall be used with 2” corporation stops and shall be on the Department of Public Utilities Approved Product List., where xx varies depending upon the main water service diameter. These tapping saddles shall be bronze with stainless steel, double strap service clamps.

(aa) **Tapping Sleeves** shall meet requirements of ANSI/AWWA C110/A21.10-93 for pressure ratings shown on the construction plans. Sleeves shall be on the Department of Public Utilities Approved Products List. The tapping sleeve shall be for the size and type of pipe shown on the construction plans

(bb) **Fire Hydrants** shall have mechanical joints with full 360 degree revolving heads and be of the safety flange, breakaway top type, meeting requirements of ANSI/AWWA C502-94. Hydrants shall have a barrel diameter no smaller than 6”, a hydrant valve diameter no smaller than 4 ½”, and shall be equipped with two 2 ½” hose nozzles and one 4 ½” pumper connection. Hose and pumper outlet threads shall match City of Virginia Beach Fire Department equipment. Hydrants shall be Mueller Company Super Centurion 250; American Darling, Model MK73-2 and/or MK73-5; Kennedy, Model K-81D; or Clow Corporation, Medallion. No substitutes will be accepted.
(cc) Water Meter Boxes for 5/8-inch through 1-inch Meters shall be cast iron Capital Foundry Model # MBX-HD (Heavy Duty Lid) or on the Department of Public Utilities Approved Products List.

(dd) Steel Pipe

1. Shall meet requirements of AWWA C200 "AWWA Standard for Steel Water Pipe 6” and larger." Affidavit of compliance with standard shall be required.

2. Pipe outside diameter and wall thickness shall be as indicated on construction plans. Pipe shall be electrically welded pipe, grade B. Ends of pipe shall be field butt welded. Length of pipe shall be single random or double.

3. Fittings for steel pipe shall be fabricated to dimensions given in AWWA C208 "AWWA Standard for Dimensions for Steel Water Pipe Fittings" and shall be reinforced as indicated on construction plans.

4. Flanges, gaskets, and bolting for steel pipe shall meet requirements of AWWA C207 "AWWA Standard for Steel Pipe Flanges for Water Works Service - sizes 4” through 144”. Flanges shall be of the diameter and thickness, and bolts shall be of the number and size for flange class compatible with working pressure of the pipe on which the flanges are used.

5. Exterior, coal tar enamel coating for steel pipe shall be materials and applications as specified in Polyken YG111 tape wrap (AWWA C214); polyurethane by Madison Chemicals or fusion bonded epoxy (AWWA - C213). Affidavit of compliance shall be required. Conditions of service shall be as indicated on construction plans.

6. Cement mortar protective lining for steel pipe shall be materials and applications specified in AWWA C205 "AWWA Standard for Cement - Mortar Protective Lining and Coating for Steel Water Pipe – 4” and Larger - Shop Applied." Cement mortar lining shall not be used for sanitary force main. Lining shall be fusion bonded epoxy or polyurethane as specified above for exterior application.

(ee) Polyvinyl Chloride (PVC) Pipe and Fittings

1. PVC pipe shall be green in color with integral bell and shall be furnished in 13- to 20-foot laying lengths with gasketed joints, except where specified otherwise on the Drawings.

2. Pipe and fittings shall be manufactured from approved PVC compound conforming to ASTM D1784.
3. PVC pipe sizes 6” through 15” in diameter shall conform to ASTM D3034 SDR 18, 21, or 26.

4. PVC pipe sizes 18” through 27” in diameter shall conform to ASTM F679.

5. All PVC services lines 4” and 6” in diameter shall conform to ASTM D3034, SDR 18, 21, or 26.

6. Joints shall meet all requirements of ASTM D3034, Section 6 and shall conform to the performance requirements of ASTM D3212.

7. Rubber gaskets shall meet physical requirements specified in ASTM F477 and ASTM D1869.

(ff) **Flexible Couplings** shall be of a gasketed, sleeve type. Each coupling shall consist of a steel middle ring, two steel followers, two rubber compounded wedge section gaskets, and sufficient galvanized track head steel bolts to properly compress the gaskets. Couplings shall be of the type to match piping in which installed. Couplings shall be on the Department of Public Utilities Approved Products List.

(gg) **Flanged Adapters for Joining Plain End Pipe to Flanged Items** shall be on the Department of Utilities Approved Products List.

(hh) **Manholes**

1. Manhole frames and covers shall be roadway type with deep socket covers and shall be fitted with dust pan. Dust pan shall have lifting handles. Machine frames and covers to prevent rattling. Each cover shall have cast or embossed on it in letters not less than 1” high "SEWER." The frame and cover shall weigh at least 380 pounds. Manhole frames and covers shall be Capital Foundry Model MH-C-21-Y and watertight manhole frames and covers shall be MH-C-21-Y/WT or MH-C-21-JC-WT. All frames and covers shall receive a coat of black asphaltum paint prior to delivery. All castings shall conform to latest edition of ASTM A-48 Class 30 and shall be uniform quality.

Manhole inserts shall be manufactured from corrosion-proof stainless steel suitable for atmospheres containing hydrogen sulfide and diluted sulfuric acid and other gasses and liquids associated with sanitary sewer collection systems. The insert shall be manufactured to fit the dust cover ring, upon which it rests. A vent hole and/or a valve, or a self-sealing gas detection pressure port, shall be provided. The hole or valve shall allow a maximum release of 0.5 to 1.5 psi and 5 gallons of water per 24 hours and must be unaffected by debris that may collect in the bottom of the insert.
a. The insert body shall be manufactured of 304 stainless steel with a thickness of not less than 18 gauge. The insert body shall have a straight-side design and be properly sized to fit into the manhole frame ring, or dust cover ring, as applicable, for easy removal.

b. The outside rim of the insert shall be manufactured with a gasket to provide a seal between the insert rim and dust cover ring upon which it rests. The gasket material shall be made of close-cell neoprene and have a pressure sensitive adhesive on one side. The gasket shall be installed by the manufacturer and must be compatible with the insert material to form a long-lasting bond in wet or dry conditions.

c. The insert shall have a stainless steel “D” type spring-loaded handle, with rubber coated grip, attached to the body of the insert with high-grade stainless steel continuous fillet type weld.

d. For new construction, the insert shall be “22-inch Model C-WH Rainstopper” manufactured by Southwestern Packing & Seals, Inc., or “22-inch Lockdry” manufactured by Barton Southern Company, or approved equal.

2. Manhole steps for precast concrete manholes shall be M.A. Industries Model PS1-PF; KOR-N-SEAL Model 90312-13; Delta Pipe Products Wedg-Lok Model WL-11; or Lane International Corp Model P-10938.

4. Precast reinforced concrete manhole sections shall meet requirements of ASTM C478-82. No reduction in the inside diameter of large sanitary sewer manholes will be allowed below the cone section.

5. Protective coating for concrete manhole section interior shall be on the Department of Public Utilities Approved Products List, and in accordance with the approved construction plans and specifications.

6. Pipe to manhole connection shall be sealed with a flexible connector. The port shall be cored to the size, shape, surface finish, and location required and not cast in the manhole. The flexible connector shall be a rubber sleeve with adjustable sealing bands meeting ASTM C443-79 specifications. The connector shall be on the Department of Public Utilities Approved Products List.

(ii) Laterals shall be the same material as the sanitary sewer main. All PVC laterals shall have copper tracer wire. The wire shall extend from the mainline wye along the centerline of the lateral pipe and terminate at the cleanout. The wire shall be fastened to the lateral pipe and cleanout with stainless steel bands or plastic wire ties. Wire must UL listed and suitable for direct burial with plastic pipe to facilitate detection and tracing of underground sanitary sewer lateral piping. The wire must
be AWG 10 solid copper with green polyethylene insulation, and must be resistant to moisture, chemicals, oil, impact, crush and abrasion. Wire must be solid copper per ASTM B-3.

(jj) Mechanical Type Pipe to Wall Sleeve Seals shall be "Link-Seal" pipe to wall closures manufactured by Thunderline Corporation, Wayne, Michigan "S" model with 316 stainless steel bolts. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to fill annular space between pipe and wall opening and shall provide watertight seal between pipe and wall opening.

(kk) Castings for Air Vent/Blow Off Assemblies shall be on the Department of Public Utilities Approved Products List. Frame and cover shall weigh at least 140 pounds.

(ll) Castings for Sanitary Sewer Main Line Cleanout Assemblies shall be on the Department of Public Utilities Approved Products List.

(mm) Castings for Sanitary Sewer Lateral Cleanout Assemblies shall be vertical and on the Department of Public Utilities Approved Products List.

(nn) Select Material Used in Trench Backfilling - Soil material obtained from roadway cuts, borrow pits or commercial sources that is designated or reserved for use as trench backfill or other specified purposes and having minimal California Bearing Ratio (CBR) value of 18 and meeting the requirements of VDOT Section 207, Section Material, Type III.

(oo) Suitable Material - Soil material obtained from on-site project trenching operations that can be re-used in backfilling operations. Within the roadway prism, suitable material must meet all the requirements established for Select Material. Outside the roadway prism, suitable material does not need to meet the requirements of Select Material except that the materials shall be free from roots, muck or debris.

(pp) Aggregate Base Material - Soil material designated or reserved for use as a foundation for pavement or other specified purpose and meeting the requirements of VDOT Section 203. Crushed concrete material should be within pH range 6.5 to 10.5, and lab certified for every 2000 tons of material.

520.03 - Procedures

(a) Familiarization

1. The Contractor shall be responsible for anticipating and locating all underground utilities and obstructions.

2. When construction appears to be in close proximity to existing utilities, the trench(es) shall be opened a sufficient distance ahead of the work or test pits made to verify the exact locations and inverts of the utility to allow for possible changes in line or grade.
3. Test pits will be performed within the project for the purpose of locating underground utilities prior to excavation. Prior to any test pit operation, the Contractor is to review the location, number of test pits and the existing utilities with the Owner. The contractor shall obtain the vertical and horizontal location, measured off of the construction center line or base line, and determine the size of the utility line being test pitted. Test pits performed without prior determine the size of the utility line being test pitted. Test pits performed without prior authorization from the Owner will be at the Contractor’s expense. Materials for backfill and pavement replacement shall meet applicable provision of these specifications.

(b) Excavation

All excavating, backfilling, and compacting for the construction of water and sanitary sewer lines, appurtenances and structures shall be in accordance with the provisions of this section.

1. Excavation shall consist of the removal of all materials, including pavement and soil-cement and any other man-made features, and shall include sheeting, dewatering and other methods necessary to construct the water and sanitary sewer lines, structures, and appurtenances.

2. Trenches for the pipelines shall be excavated generally along straight lines and bottoms shall be uniformly graded as required. Excavations which have been carried below the established grade, due to negligence or faulty work of the Contractor, shall be backfilled to the proper grade with approved backfill or bedding material, at no additional cost to the Owner. Excavation required for removal of unsuitable materials not caused by the Contractor’s activities, as determined by the Owner, shall be replaced by backfilling with Pipe Bedding or Coarse Aggregate Fill. Pipe settlement caused by yielding foundations shall be corrected by the Contractor, at no additional cost to the Owner. Bell holes where applicable, shall be dug sufficiently large to insure the making of proper joints. The Contractor shall dewater the trenches below the grade lines of the pipe at all times during the installation of pipelines.

3. VDOT #57 aggregate or fine aggregate (grading A) may be used as pipe bedding. VDOT #57 can also be used as coarse aggregate fill, when directed by the Owner, and shall be installed as shown on the construction plans. Stone larger than 1” in diameter shall not be used in the backfill until the pipe has a cover of not less than one foot, and the remainder of the backfill to original ground or to within 12” of finished subgrade shall not include stones larger than 4” in its greatest dimension.

4. Pipelines installed outside the roadway prism shall be backfilled in 8” layers, loose thickness, and compacted to a density of not less than 85 percent of maximum density prior to placing the next layer of backfill material. When
suitable, material excavated onsite shall be used as backfill for pipelines installed outside the roadway prism.

5. Pipelines installed inside the roadway prism shall be backfilled in 8” layers, loose thickness, and compacted to a density of not less than 95 percent of the maximum density prior to placing the next layer of backfill material. Backfill material for pipelines installed inside the roadway prism shall have a California Bearing Ratio (CBR) equal to 18. Suitable backfill material obtained onsite may be used. A Certificate of Conformity with the backfill and CBR-18 requirements described herein, from an approved independent testing lab, shall be required before onsite material can be used for backfill proposed inside the roadway prism. If suitable CBR-18 backfill material is not available onsite, then suitable CBR-18 backfill material shall be obtained offsite.

6. Pipelines inside the roadway prism shall be defined as those pipelines whose trenches are made in the subgrade of proposed or existing pavement, and all trenches outside of the subgrade where the inner edge of the trench is closer than two feet to the edge of the proposed or existing pavement, stabilized shoulder, curb, bikepath, or sidewalk.

7. When work is not in progress, for any reason, the lines shall be securely plugged, capped, or connected to the satisfaction of the Owner.

8. If the Contractor uncovers a water service line constructed of material other than copper, cast iron, or ductile iron, the Contractor shall immediately inform the Owner.

9. After backfilling, the Contractor shall maintain a smooth riding surface until pavement repairs are completed. Unless otherwise specified, all cost for this work described in this section shall be considered incidental to the work on this contract and will not be measured for separate payment.

(c) Delivery and Storage

The Contractor shall ensure that pipes, fittings and other materials shall be carefully handled to prevent breakage and damage. PVC pipe and fittings shall be stored in accordance with the recommendations of the manufacturer to prevent UV damage. Pipes shall not be unloaded by rolling or dropping from trucks or cars, but shall be handled by carefully lifting and lowering into position, using approved slings or clamps. Any material which has been damaged shall be removed and replaced with sound material.

(d) Inspection of Pipe and Fittings
Pipe and fittings shall be carefully inspected by the Contractor for cracks and defects before lowering into the trench, and the Contractor shall remove faulty pipe or fittings from the site and replaced with sound material.

(e) **Pipe Installation**

1. All pipe fittings shall be carefully handled with satisfactory slings or other devices to prevent damages to protective coatings or joints. Lifting equipment shall be satisfactorily rated to handle the pipe size required for this project. Each section of pipe shall be thoroughly inspected by the Contractor for defects before being lowered into the trench. Pipe shall be laid true to line and grade with bells upstream and shall be joined together such that the completed pipe will have a smooth invert without joint deflection. The bottom of the trench shall be shaped to the curvature of both the bell and barrel of the pipe. The trench shall be kept free of water at those times that work is in progress. The ends of the pipe shall be cleaned so that proper joints can be made. As the work progresses, the interior of the pipe shall be cleared of dirt, cement, or other superfluous material. At the end of each work day, the exposed end of all pipe and fittings shall be fully closed to prevent earth, water, or other substances from entering the pipe. Not more than 100 feet of trench shall be opened in advance of the pipe laying unless authorized by the Owner.

2. Installation of green PVC gravity sanitary sewer pipe shall be in strict accordance with manufacturer's recommendations.

3. Installation of ductile iron pipe with Protecto 401 shall be in strict accordance with ANSI/AWWA C600.

4. The joining of like pipe shall be accomplished using solid sleeves of like material. Shop drawings shall be submitted to the Owner for approval. Use of retainer glands with D.I. sleeves is required in pressure applications.

5. The Contractor shall provide the Owner with details of and method that he intends to use for the buttressing of plugs placed in the line for testing purposes.

6. Where nonferrous metallic pipe (for example copper tubing) crosses any ferrous piping material, maintain vertical separation of 18”. If 18” of clearance cannot be maintained, neoprene padding must be installed between the two utilities.

7. The joining of unlike types of pipe shall be accomplished by commercially manufactured couplings as detailed on the construction plans and fittings acceptable to the Owner. Shop drawings shall be submitted.
8. Corporation stops for testing, chlorination, and venting air during construction shall be installed at locations specified in the field by the Owner. The inlet shall be male 1” in size and the outlet shall have 1” external threads and screwed caps. After the completion of testing and chlorination cap the corporation.

(f) **Mechanical Joint Pipe**

Shall be joined in accordance with manufacturer's printed recommendations. Tighten nuts on alternate sides of the gland until pressure on the gland is equally distributed. Maximum permissible deflection of mechanical joint pipe in pressure mains shall be 80% of the values listed in the following table:

<table>
<thead>
<tr>
<th>Nominal Pipe Size Inches</th>
<th>Deflection Angle Degrees</th>
<th>18 foot length</th>
<th>20 foot length</th>
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<tr>
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<td>Maximum Offset in Inches</td>
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**AWWA C600**

Maximum Joint Deflection Full-Length Pipe - Mechanical-Joint Pipe
(g) **Push-on Joint Pipe**

Shall be joined in accordance with manufacturer's printed recommendations. Maximum permissible deflection of push-on joint pipe in pressure mains shall be 80% of the values listed in the following table.

**AWWA C600**

Maximum Joint Deflection Full-Length Pipe - Push-on Type Joint Pipe

<table>
<thead>
<tr>
<th>Nominal Pipe Size Inches</th>
<th>Deflection Angle Degrees</th>
<th>18 foot length</th>
<th>20 foot length</th>
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<td></td>
<td>Maximum Offset in Inches</td>
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* For 16-inch and larger push-on joints, maximum deflection angle may be larger than shown above. Consult manufacturer.

(h) **Steel Pipe**

1. Join steel pipe by field welding in accordance with requirements of AWWA C206 "AWWA Standard for Field Welding of Steel Water Pipe" or join steel pipe by use of flexible couplings as recommended by the manufacturer and as detailed on construction plans.

2. Repair interior pipe lining in welded steel water pipe in accordance with applicable section of AWWA and manufacturers recommendations.

(i) **Polyvinyl Chloride (PVC) Pipe** shall be joined as recommended by the manufacturer using rubber ring gaskets in bell ends.

(j) **Valves and Valve Boxes**

1. Install valves with operator stems in the vertical plane through the pipe axis and perpendicular to the pipe axis. Locate valves shown on construction plans. Thoroughly clean and check valves for satisfactory operation before installation. Valves to be set no more than 3-feet from tees and hydrant lines.
2. Equip all underground valve operators with valve boxes. Set box in alignment with valve stem centered on valve nut. Set valve box to prevent transmitting shock or stress to the valve. Set box cover flush with the finished ground surface or pavement. Valve boxes set flush with finished ground surfaces outside of paved areas shall in addition have a 24” square by 6” thick concrete pad poured around the box to insure box stability.

3. The box shall be touched up with one coat of black asphaltum paint prior to installation.

4. Valve box lids which exhibit a tendency to flip over or out of the valve box under traffic shall be replaced at no additional cost to the owner.

5. Provide valve box extensions, as required, to bring valve box cover flush with finished ground surface or pavement.

6. Provide valve operator extensions, as required, to bring operating nut to within 12” minimum – 24” maximum of grade.

7. Provide air vent/blow off assembly as shown on construction plans.

(k) **Fire Hydrants**

1. Locate fire hydrants at such a distance from the curb or edge of pavement to provide ready access and minimize the possibility of damage from vehicles in accordance with Department of Public Utilities standard hydrant setting details. Orient the hydrant so that the pumper nozzle faces the pavement. Set hydrant plumb and with the bury line on the hydrant at grade. Provide anchorage and at least 0.5 cubic yards of coarse aggregate fill around the base and above the weep hole to allow drainage from the hydrant ball-drip drain valve.

2. Hydrant service signs as shown on the plan details shall be placed by the contractor on newly installed fire hydrants not yet in service as directed by the Inspector. Signs shall remain in place until removal is approved by the Inspector. Hydrant service signs shall be placed by the Contractor on existing hydrants temporarily taken out of service as directed by the Inspector. Such signs shall remain in place until removal is approved by the Inspector.

(l) **Tapping Sleeves and Tapping Valves** shall be set to avoid interference with existing pipe joints. The tap size shall be at least one size smaller than the main. After all tapping sleeves and valves have been set in place, a pressure test shall be made to insure that there are no leaks around the sleeve or through the valve prior to tapping. All leakage shall be corrected. The sleeve and valve shall each be tested,
separately, at 150 psi for two (2) hours. Tapping sleeves and valves installed on HRSD (Hampton Roads Sanitation District) sanitary sewer force mains shall each be tested separately, by HRSD personnel, to meet HRSD testing requirements. HRSD shall be contacted through the Owner to schedule the test.

(m) **Plugs, Caps, Tees, Bends, Reducers, Wyes, and Tapping Sleeves and Valves** shall be provided with thrust restraint. Thrust restraint shall be in accordance with the section on Thrust Protection. Pipe shall be sealed at those locations shown on the construction plans and at the termination of the work day with standard plugs/caps as normally used for the size and material of the pipe used in this project. Existing water mains and sanitary sewer force mains and gravity mains to be abandoned in place shall be filled with flowable fill, unless otherwise indicated on the construction plans, and sequenced as approved by the Owner.

(n) **Adjustment of Existing Valve Boxes** shall be made as shown on plan details to finished grade. Extensions, as required, will be provided to bring the valve box cover flush with the finished ground surface or pavement. Riser/adjustment rings will not be permitted.

(o) **Relocated Existing Fire Hydrants** shall be reset in the manner described above in Item K, Fire Hydrants, and the following: Existing fire hydrants that are to be relocated shall be unfastened from the present locations and stored in a satisfactory manner. The ends of the exposed pipe shall be plugged by an approved method to eliminate all debris from entering. The Contractor shall be responsible for storing the hydrant in a sanitary place until such time as the hydrant is to be placed in the relocated position and set to final grade.

(p) **Adjustment of Existing Fire Hydrants to Grade** shall be performed in-place and set to the finished grade, plumb and with the bury line at grade.

(q) **Adjustment of Existing Water Meter or Detector Check and Boxes** shall be performed in-place as shown on the construction plans to finished grades. Maximum depth of service lines in the maintenance area shall be 36”. Fire service and/or domestic service larger than 2” shall have from 30” to 36” of cover from finished grade at the box. Curb stops for domestic meters 1” and smaller shall have 12” of cover from finished grade at the box. Curb stops for 1 ½” and 2” domestic meters shall have 12” to 14” of cover from finished grade at the box.

(r) **Relocation of Existing Meter or Valve and Box** shall be reset in the manner prescribed herein for setting and adjusting of valves, valve boxes, meters and meter boxes, detector check and vault boxes. Existing valves or meters that are to be relocated shall be unfastened from the present locations and stored in a satisfactory manner. The ends of the exposed pipe shall be plugged by an approved method to eliminate all debris from entering. Relocated meter or valve and box shall be set to proposed finished grade. Service lines from meters shall have 12” of cover.
(s) **Installation of Water/Sewer Valve Extension Stem on Existing Valve** shall be in accordance with City of Virginia Beach, Department of Public Utilities Standard Details. Valve operator extensions, as required, will be provided to bring operating nut to within 12” minimum – 24” maximum, of finished grade.

(t) **Restoration of Property** shall include, but not be limited to, replacement of lawn sprinkler systems, electronic dog fences, shrubbery, sod or topsoil, including lime, fertilizer, seed and mulch; replacement of non-paved surfaces with similar materials and for other work in accordance with Section 107.12.

(u) **Thrust Protection**

1. Thrust protection is to be at all changes in direction of pressure pipe lines, as shown on the approved construction plans and specifications and in accordance with the Department of Public Utilities’ approved products list.

2. Thrust protection on existing slip joint pipe shall consist of a joint harness system.

3. Thrust protection consisting of concrete thrust blocks, saddles or other structures, shall be constructed against undisturbed soil in accordance with the detail on the construction plans and shall be limited to only where explicitly specified on the construction plans.

4. Concrete thrust restraint shall be substituted for mechanical thrust restraint only with the expressed prior written permission of the Owner.

5. Joint restraints shall be required on hydrant installations from the tee to the hydrant.

6. Thrust blocks will not be required behind temporary plugs used during construction. Plugs in pressure lines that will remain upon completion of construction are considered permanent and will be mechanically restrained; thrust blocks will not be permitted. Branch lines from tapping sleeves and valves shall be restrained as required for tees.

7. All thrust protection shall be placed before backfilling of the trench and under the direct supervision of the Owner. Thrust protection installed without inspection by the Owner shall be uncovered for inspection at the Contractor's expense. Thrust protection shall be provided at all plugs, caps, tees, bends, reducers, tapping sleeves and valves, and other fittings as required by the specifications and/or as shown on the construction plans. Only retainer glands or lock-type feature joints shall be used on vertical bends. Temporary buttressing for testing shall be provided. Installation of approved retainer glands, tie rods, or other thrust restraints shall be in accordance with the manufacturer's instructions.
8. Connections to HRSD sanitary sewer force mains shall be installed as detailed in the Contract Documents. Only retainer glands, joint harnesses or lock-type feature joints shall be used for restraint. Concrete thrust blocks shall not be used. Prior to the connections to the HRSD force main, a City of Virginia Beach Department of Public Utilities valve shall be installed.

9. In special circumstances, tie rods may be used if approved by the Owner. The size and number of tie rods for pipe size is as shown in the following table:

<table>
<thead>
<tr>
<th>Pipe Size in Inches</th>
<th>No. Bolts/Joints</th>
<th>No. Rods</th>
<th>Rod Size in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>6</td>
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<td>8</td>
<td>6</td>
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</table>

(w) **Gravity Sanitary Sewers** shall be installed so as to maintain a true alignment and grade as indicated on construction plans. No joint deflection shall be permitted. After completion, the pipe shall exhibit a full circle of light when lighted at one manhole and viewed from the next. Commence laying gravity sewers at the lowest point on a section of line and lay pipe with the bell ends upgrade.

Pipe Joint: Preparatory to making pipe joints on gravity sanitary sewer lines, clean and dry all surfaces of joint pipe and jointing material. Use lubricants, primers, adhesives, and similar materials as recommended by the manufacturers. Place, fit, join, and adjust the jointing materials or factory fabricated joints as recommended by the manufacturer to obtain the degree of water tightness required. As soon as possible after the joint is made, place sufficient backfill material along each side of the pipe to resist forces that might tend to move the pipe off line and grade. Place backfill over the pipe immediately after the pipe has been laid.

(x) **Force Main Pipe** shall be laid with bell ends facing the direction of laying. Where grade is 10 percent or greater, pipe shall be laid uphill with bell ends upgrade. After the installation of every joint of pipe, the elevation shall be verified as per the construction plans.

(y) **Force Main Air Vent/Water Blow-off Assemblies** shall be provided at locations indicated on construction plans and at all high points on the mains. Construct boxes for air vent/blow-off assemblies as indicated on construction plans. All fittings shall be threaded.
(z) **Manholes** shall be precast reinforced concrete manhole sections conforming to ASTM C478 in accordance with the City of Virginia Beach Department of Public Utilities’ Standard Details. Where directed by the Owner, manholes may be constructed of brick and mortar conforming to ASTM C270, “Type S, Mortar for Unit Masonry”. Install manhole frames and covers and manhole steps shall be on the Department of Public Utilities Approved Products List.

On new, adjusted or reconstructed sanitary sewer manholes, metal riser rings will not be permitted. Final adjustment of cover and frame shall be by use of bricks and/or mortar under the frame. Concrete rings, 4” minimum to 12” maximum, will be permitted for adjustment or reconstruction of manholes.

(aa) **Sanitary Sewer Benches and Inverts**

1. Sanitary sewer benches and inverts shall be formed out of brick and a cement/mortar mixture.

2. Inverts and channels shall be formed out of brick and the cement/mortar mixture, be ¾ the diameter of the effluent pipe, be surfaced with the cement/mortar mixture ½” thick, and be trowel finished. Any influent lines entering the manhole less than 180° from the effluent line shall be formed in a continuous curve. Benches shall be formed out of brick and surfaced with the cement/mortar mixture and be trowel finished with a 2” positive slope from the top of the invert channel. Each layer of brick used in the benches and inverts shall be set in a full bed of the cement/mortar mixture. All voids shall be filled with the cement/mortar mixture before the next layer is applied. There shall be 0.1 ft. of fall between the outgoing channel and the lowest incoming channel.

3. The cement mortar mixture shall consist of one part Type II Portland cement, one part Type S masonry cement, 2½ parts fine aggregate (masonry sand), and sufficient water to produce a stiff mixture or one part Type M masonry cement, 2½ parts fine aggregate (masonry sand), and sufficient water to produce a stiff mixture.

(bb) **Sleeves** shall be used where pipes, valves, stem extensions, or equipment parts pass through concrete or masonry walls or slabs. Sleeves shall be of sufficient size to allow sealing around pipes and clearance for valve stems or equipment. Extend vertical sleeves through slabs 1” above top surface. Use cast iron or steel sleeves with intermediate collars to anchor and provide water stops on sleeves that pass through exterior walls below grade. Seal around pipes using modular mechanical type pipe and wall seals installed in accordance with the recommendations of the manufacturer.
(cc) Pavement Patches of Utility Trenches

1. Pavement patches of utility trenches shall include, but not be limited to, replacement of paved or finished surfaces with similar materials as shown on the construction plans.

2. Where adjacent pavements are to be retained, pavement removed for pipe line trenches shall be replaced in kind with equal or better material.

(dd) Bricks Used to Form Structures shall be laid in courses with mortar joints having the solid or cored beds positioned in a horizontal plane. The brick end or face shall not be used as the bedding plane.

520.04 - Testing

(a) Acceptance Tests for Water Mains and Accessories:

1. The Contractor shall supply the pumps, water, temporary buttressing for testing purposes, gages and meters (calibrated within 90 days of actual test), disinfectant and all the necessary apparatus and labor. The Contractor shall notify the Public Utilities Inspections Office at least 48 hours in advance of the test date and shall perform tests in presence of the Inspector. Hydrostatic tests shall be in accordance with ANSI/AWWA C600.

2. After thrust restraint has been installed and the line has been backfilled and at least seven days after the last concrete reaction anchor has been poured, subject the line or any valved section of the line to a hydrostatic pressure test. The test shall be conducted in the presence of the Inspector. Fill the system with water at a velocity of approximately 1 foot per second while necessary measures are taken to eliminate all air. Existing City of Virginia Beach valves may only be opened and closed by or under the direct supervision of the Owner. After the system has been filled, raise the pressure by pump to 150 psi plus or minus 5 psi. Test shall have a 2-hour duration. Lines of different sizes shall be tested separately. Hydrant valves (6” branch to hydrant) shall be in the open position. Valves preceding kicker joints shall be in the open position. Pressure shall be applied at intervals not to exceed 1,000 feet.

3. Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the inspector. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. Allow the system to stabilize at the test pressure before conducting the leakage test. All taps for testing and chlorination shall be at least 1”.

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4. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If hydrants or permanent air vents are not located at all high points, the Contractor shall install corporation stops at such points so that the air can be expelled as the line is filled with water. After all air has been expelled, the corporation stop shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation stops shall be removed and plugged or left in place at the discretion of the Owner.

5. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. All damaged or defective pipe, fittings, valves, or hydrants that are discovered following the hydrostatic pressure test or leakage test shall be repaired or replaced with sound material, and the test shall be repeated until it is satisfactory to the Owner.

6. A leakage test shall be conducted concurrently with the hydrostatic pressure test. The leakage test shall be performed with a calibrated water meter, calibrated pressure gauge, measured container, pump and water. The Contractor shall provide certification of the calibration of testing devices indicating devices were calibrated within 90 days of actual tests. All equipment, etc., shall be approved by the Inspector prior to performance. Leakage is defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof, to maintain pressure within, plus or minus 5 psi of the specified test pressure, after air in the pipeline has been expelled, and the pipe filled with water. Leakage shall not exceed that quantity obtained by the formula below. If leakage exceeds that determined by the formula, find and repair the leaks and repeat the tests until successful. The leakage formula shall be as follows:

For all material types except for welded steel:

\[ L = \frac{SD \times \sqrt{P}}{133200} \]

where \( L \) = allowable leakage in gallons per hour
\( S \) = length of pipeline tested in feet
\( D \) = nominal diameter of the pipe in inches
\( P \) = average test pressure during leakage test in PSIG

### Allowable Leakage per 1000 ft. (305m) of pipeline - gph*

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter - inches</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
<th>30</th>
<th>36</th>
<th>42</th>
<th>48</th>
<th>54</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test pressure psi (Bar)</td>
<td>150 (10)</td>
<td>0.37</td>
<td>0.55</td>
<td>0.74</td>
<td>0.92</td>
<td>1.10</td>
<td>1.47</td>
<td>1.84</td>
<td>2.21</td>
<td>2.76</td>
<td>3.31</td>
<td>3.86</td>
<td>4.41</td>
</tr>
</tbody>
</table>

* To obtain leakage in liters/hour, multiply the values in the Table by 3.785
7. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/h/in (0.0012 L/H/mm) of nominal valve size shall be allowed.

8. When hydrants are in the test section, the test shall be made against the closed hydrant.

9. All visible leaks shall be repaired regardless of the amount of leakage.

10. No leakage will be allowed for any welded steel pipe. If leaks are revealed by test, repair by rewelding. Peening of leaks with a hammer will not be allowed.

11. If any test of pipe laid discloses defects due to hydrostatic pressure test or leakage greater than that specified above, the Contractor shall, at his own expense, locate and make repairs in a manner approved by the Inspector and perform tests again until results are within allowable limits.

12. The corporation stops installed for this test shall be removed turned off and capped.

13. Flushing, Disinfection, and Bacteriological Testing shall be performed in accordance with the procedures listed below to meet requirements of the City of Virginia Beach Department of Public Utilities. Water will be furnished by the Owner. The Contractor shall provide all loading, hauling, discharging and clean-up necessary. Contractor shall be responsible for properly treating the discharge during disinfection, testing, and flushing activities.

a. Water lines shall be flushed every 2,000 feet unless the Owner gives the Contractor written permission for flushing longer lengths of pipeline due to drainage considerations. All the pipe within the flush length must be the same diameter. No more than 4,000 feet of pipeline shall be flushed at any one time, under any circumstances.

b. Pipelines shall be flushed with a minimum full diameter of pipe for pipe sizes 4” through 12” in diameter, inclusive. Pipelines larger than 12” in diameter shall be flushed for a minimum of one half the pipe diameter. For all pipelines, all valves and hydrants shall be operated during flushing and disinfection and the flushing velocity shall be not less than 2.5 feet per second; moreover, the flushing shall continue until the flushed water runs clear for 5 minutes.

c. Unless otherwise noted on the construction plans, water lines 10” and larger in diameter shall be flushed at night, beginning promptly at midnight and ending before 6:00 A.M., Monday through Thursday, but not on city holidays. The Contractor shall request permission from the Public Utilities
Inspections Office for such flushing and shall make the request five days prior to the planned flushing. The Owner will make every reasonable effort to schedule the flushing as requested by the Contractor; however, the Owner does not guarantee that flushing will be permitted when requested.

d. Unless otherwise noted on the construction plans, water lines 8” and smaller in diameter may be flushed during regular city work hours, Monday through Thursday, but not on city holidays. The Contractor shall schedule such flushing with the Public Utilities Inspections Office 48-hours prior to the planned flushing.

e. All pipe shall be filled with potable water which must wet the entire inside diameter at least 24 hours prior to flushing.

f. Flushing operations shall be coordinated through the Inspector. Existing City of Virginia Beach valves may only be opened and closed by or under the direct supervision of the Department of Public Utilities Operations personnel or the Inspector. No existing City of Virginia Beach valve shall be opened without first opening a blow-off, such as a hydrant or end of main. Reverse procedure when shutting down blow-off; close source valve first. Blow-off through all hydrants, one at a time.

g. No lines shall be flushed through 90° bends, at tees, or similar appurtenances. All lines shall be flushed prior to the installation of a reducer; and each succeeding smaller line shall be raised high enough to prevent recontamination of the line when flushing is completed. The Contractor shall make adequate provisions for drainage and discharge of flushing water.

h. The Contractor shall notify the Department of Public Utilities Inspections Office (385-4171) at least 24 hours prior to commencing chlorinating procedures, and the day prior to each successive day of disinfecting operations. Disinfection of the completed sections shall not relieve the Contractor of his responsibility to repair or replace any defective pipe.

i. Methods of Chlorine Application Continuous Feed Method - (ANSI/AWWA C651) Water from the existing distribution system shall require and air break or RPZ so the potable water system does not come into contact with the super chlorination zone, or other approved sources of supply shall be made to flow at a constant, measured rate into the newly-laid pipeline. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/l free chlorine. To assure that this concentration is maintained, the free chlorine residual shall be measured at intervals not exceeding 2,000 feet in accordance with the procedures described in the current edition of "standard methods" and AWWA M12 "Simplified Procedures for Water
Examination." The method used must be able to differentiate between free chlorine and combined chlorine. In the absence of a meter, the rate may be determined either by placing a pitot tube gage at the discharge or by measuring the time to fill a container of known volume.

In October 2000, Virginia Beach and Norfolk changed the disinfectant used in the water distribution system from chlorine to monochloramine. As a result, water from the distribution system no longer has a free chlorine residual, but instead has a combined chlorine residual of 2 to 3 mg/l. The combined chlorine will exert a free chlorine demand of approximately 5 mg/l. Thus, the make-up water (if supplied from the water distribution system) will neutralize approximately 5 mg/l of free chlorine. This 5 mg/l free chlorine demand must be taken into account in determining the amount of chlorine necessary to achieve a 50 mg/l free chlorine residual.

(1) Form of chlorine for disinfection: Gaseous/Liquid chlorine shall not be used. Calcium hypochlorite or Sodium hypochlorite shall be used.

(2) Calcium hypochlorite contains approximately 70 percent available chlorine by weight. It shall be either granular or tabular in form. The tablets, six to eight to the ounce, are designed to dissolve slowly in water. A chlorine-water solution shall be prepared by dissolving the granules or tablets in water in the proportion requisite for the desired concentration.

(3) Sodium hypochlorite is supplied in strengths from 5.25 to 15 percent available chlorine. The chlorine-water solution shall be prepared by adding hypochlorite to water. Product deterioration shall be reckoned with in computing the quantity of sodium hypochlorite required for the desired concentration.

(4) Application - The hypochlorite solutions shall be applied to the water main with an Owner approved system, designed for feeding chlorine solutions. Feed lines shall be of such material and strength as to withstand safely the maximum pressures that may be created by the pumps and the chemical nature of the fluid. All connections shall be checked for tightness before the hypochlorite solution is applied to the main. Chlorinating apparatus shall be clean. Chlorine shall be introduced no further than four feet from the source valve.

j. Table 1 gives the amount of chlorine required for each 100 feet of pipe for various diameters. Solutions of 1 percent chlorine may be prepared with
sodium hypochlorite or calcium hypochlorite. The latter solution requires approximately 1 pound of calcium hypochlorite in 8.5 Gallons of water. Table 1 includes an allowance for a 5 mg/l free chlorine demand assumed to be exerted by make-up with a combined chlorine residual (i.e., monochloramine) of 2 to 3 mg/l.

**Table 1**

**Chlorine Required to Produce 50 mg/l Free Chlorine Concentration in 100 Feet of Pipe: by Diameter**

(including an allowance for a 5 mg/l free chlorine demand assumed to be exerted by the make-up water)

<table>
<thead>
<tr>
<th>Pipe Size Inches</th>
<th>100 Percent Chlorine Pounds</th>
<th>1 Percent Chlorine Solution Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.030</td>
<td>0.36</td>
</tr>
<tr>
<td>6</td>
<td>0.067</td>
<td>0.81</td>
</tr>
<tr>
<td>8</td>
<td>0.12</td>
<td>1.44</td>
</tr>
<tr>
<td>10</td>
<td>0.19</td>
<td>2.24</td>
</tr>
<tr>
<td>12</td>
<td>0.27</td>
<td>3.23</td>
</tr>
<tr>
<td>16</td>
<td>0.48</td>
<td>5.75</td>
</tr>
<tr>
<td>20</td>
<td>0.75</td>
<td>8.98</td>
</tr>
<tr>
<td>24</td>
<td>1.08</td>
<td>12.9</td>
</tr>
<tr>
<td>30</td>
<td>1.68</td>
<td>20.2</td>
</tr>
<tr>
<td>36</td>
<td>2.43</td>
<td>29.1</td>
</tr>
<tr>
<td>42</td>
<td>3.30</td>
<td>39.6</td>
</tr>
</tbody>
</table>

k. During the application of the chlorine, valves shall be manipulated by the Owner to prevent the treatment dosage from flowing back into the line supplying the water. Chlorine application shall not cease until the entire main is filled with the chlorine solution. The chlorinated water shall be retained in the main for at least 24 hours, but no more than 48 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24 hour period, the treated water shall contain no less than 25 mg/l free chlorine throughout the length of the main.

l. **Final Flushing** - After the applicable retention period, the heavily chlorinated water shall be flushed from the main through stand pipes and hydrants until all traces of free chlorine are absent (i.e., free chlorine residual = 0.0 mg/l) in the presence of the Owner. At least one blow-off appurtenance shall be open prior to opening source valve. No source valve shall be operated during the chlorinating process without the presence of the Owner.
Inspector. Chlorine residual determination shall be made to demonstrate that the heavily chlorinated water has been completely removed from the pipeline, that no free chlorine remains in the pipeline, and that the water in the pipeline has a combined chlorine residual of not less than 2 mg/l.

A neutralizing agent shall be applied. See Table 2 - Amount of Agent Required to Neutralize Various Residual Chlorine Concentrations.

Table 2
Amount of Agent Required to Neutralize Various Residual Chlorine Concentrations
For 100,000 Gallons of Water

<table>
<thead>
<tr>
<th>Residual Chlorine</th>
<th>Sulfur Dioxide (SO$_2$)</th>
<th>Sodium Bisulfate (NaHSO$_3$)</th>
<th>Sodium Sulfite (Na$_2$SO$_3$)</th>
<th>Sodium Thiosulfate (Na$_2$S$_2$O$_3$5H$_2$O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>mg/L</td>
<td>LB</td>
<td>LB</td>
<td>LB</td>
<td>LB</td>
</tr>
<tr>
<td>1</td>
<td>0.8</td>
<td>1.2</td>
<td>1.4</td>
<td>1.2</td>
</tr>
<tr>
<td>2</td>
<td>1.7</td>
<td>2.5</td>
<td>2.9</td>
<td>2.4</td>
</tr>
<tr>
<td>10</td>
<td>8.3</td>
<td>12.5</td>
<td>14.6</td>
<td>12.0</td>
</tr>
<tr>
<td>50</td>
<td>41.7</td>
<td>62.6</td>
<td>73.0</td>
<td>60.0</td>
</tr>
</tbody>
</table>

Table 3 - Required Flow
40 PSI Main

<table>
<thead>
<tr>
<th>Pipe Diameter, inches</th>
<th>GPM @ 2.5fps</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>200</td>
</tr>
<tr>
<td>8</td>
<td>400</td>
</tr>
<tr>
<td>10</td>
<td>600</td>
</tr>
<tr>
<td>12</td>
<td>900</td>
</tr>
<tr>
<td>16</td>
<td>1,600</td>
</tr>
</tbody>
</table>

To estimate the minimum flushing time and the amount of neutralizing agent needed, use the following, where:

L = length of pipe being chlorinated, feet
t = estimated minimum flushing time, seconds
Fr (d) = flow rate, from Table 3, as function of pipe diameter, GPM
Q = Flushing discharge, gallons
N = estimated amount of neutralizing agent as function of concentration, from Table 2, pounds
(1) Determine the estimated minimum flushing time, \( t \), in seconds:
\[
\frac{L}{2.5}
\]

(2) Determine the estimated minimum flushing discharge, \( Q \), in gallons:
\[
\frac{t + 300 \times Fr \ (d)}{60}
\]

(3) Determine the estimated amount of neutralizing agent, \( N \), in pounds:
\[
\frac{Q \times \text{Table 2 value for given residual chlorine and type of neutralizing agent}}{100,000}
\]

14. Bacteriologic Tests

a. After final flushing and before the water main is placed in service, samples shall be collected and tested for bacteriologic quality and shall show the absence of coliform organisms. At least two samples shall be collected at least 24 hours apart at intervals not exceeding 1,000 feet. Tests will be conducted by the Owner. Samples shall not be taken from fire hydrants. Sampling taps shall be provided by Contractor and be a 1” corporation stop and copper riser pipe, and shall be within two feet of valves.

b. Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate. If laboratory results indicate the presence of coliform bacteria, the samples are unsatisfactory and the entire disinfection process shall be repeated until two successive samples are satisfactory. A sampling tap consisting of a corporation stop with metal pipe shall be installed within 2 feet of valves or end of line plugs. The corporation stop inlet shall be male, 1” in size, and the outlet shall have 1” external threads and screwed caps. No further than 4-feet away from source valve.

c. Cleaning, disinfection, and testing will be the responsibility of the Contractor. Water for these operations will be furnished by the Owner. The Contractor shall include in his bid the cost of loading, hauling, and discharging the water.

d. Samples shall not be collected on Fridays, Saturdays, Sundays, city holidays, nor the day before city holidays. Sampling and testing shall be by the Owner; or in extraordinary circumstances, by the Contractor with the written consent of the Owner. Tests shall be made by a state certified laboratory.
e. Testing and disinfection of the completed sections shall not relieve
the Contractor of his responsibility to repair or replace any cracked
or defective pipe. All work necessary to secure a tight line shall be
done at the Contractor's expense.

(b) **Acceptance Tests for Gravity Sewer Lines, Manholes and Low-Pressure Force
Mains**

All sanitary sewer lines shall be tested as the work progresses by low pressure air
test. Manholes shall also be tested separately for final acceptance, using a vacuum
test method, as directed by the Inspector. Tests shall be conducted on short sections
of sewer line; i.e., between structures. Installation of sewers will not be permitted
at a point more than 1,000 feet ahead of any section of sewer or any manhole which
has not been given the final test and accepted. The Contractor shall provide all labor,
materials, tools, and equipment necessary to make the tests. All equipment and
methods used shall be acceptable to the Inspector. The Contractor shall notify the
Owner at least 48 hours in advance of the test and perform tests in the presence of
the Inspector. All monitoring gages shall be subject to calibration, if deemed
necessary by the Inspector. All sewer lines, regardless of size, that cross under
streams shall be tested from manhole to manhole for infiltration and exhibit zero
infiltration. The low-pressure force main shall be tested in accordance with the
Manufacturer’s recommendations.

1. **Low Pressure Air Test:**

   a. An air test conforming to ASTM Specification F1417, shall be
      performed on all gravity sewer mains prior to acceptance. The
      Contractor is responsible for supplying an air-testing rig and
      pressure gauge, calibrated to the tenth of a pound, for the test.

   b. The Contractor shall furnish all the necessary equipment and be
      responsible for conducting all low-pressure air tests. The Owner
      shall witness all low-pressure air tests and verify the accuracy and
      acceptability of the test and the equipment utilized. The Contractor
      is responsible for any repair work on sections that do not pass the
      test.

   c. After a manhole-to-manhole reach of pipe has been backfilled to
      final grade and prepared for testing, plugs shall be placed in the line
      at each manhole and secured. Once the plugs are in place and the air
      hoses connected, the plugs shall be inflated and the sewer line
      pressurized to the test pressure.

   d. All plugs shall be installed and properly inflated to prevent blowout.
      All pressurizing equipment used for low-pressure air testing shall
      include a regulator or relief valves set no higher than nine (9) pounds
per square inch gauge to avoid over pressurizing and displacing temporary or permanent plugs. No person shall enter a manhole while air is being forced into a pipe with plugs in place or when any pressure remains behind the plugs.

e. All plugs shall be capable of resisting internal testing pressures without the aid of external bracing or blocking. If pneumatic plugs are utilized, a separate hose is required to inflate the pneumatic plugs from the aboveground control panel. To facilitate test verification by the Owner, all air used shall pass through a single, aboveground control panel. The above-ground air control equipment shall include a shut-off valve, pressure regulating valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from zero (0) to at least ten (10) psig. The gauge dial shall be divided in 0.1 psi or smaller increments. The gauge shall have an accuracy of 0.04 psi. Two separate hoses shall be used (in addition to hose for pneumatic plugs) to: (1) connect the control panel to the sealed line for introducing low-pressure air, and (2) a separate hose connection for constant monitoring of air pressure build-up in the line.

f. All service laterals, clean-outs, stubs, and fittings within the sewer test section shall be properly capped or plugged during construction to prevent air loss that could cause an erroneous air test result.

g. Air shall be supplied slowly to the section of the sewer being tested until the internal pressure reaches 4.0 psig greater than the average back pressure of groundwater above the pipe, but not greater than 9.0 psig. The groundwater adjustment shall be calculated by dividing the average vertical height, in feet of groundwater above the invert of the sewer pipe to be tested, by 2.31. The result gives the adjustment in pounds per square inch that must be added.

h. After an internal pressure of 4.0 psig (plus required groundwater adjustment) is obtained, allow at least two minutes for air temperature to stabilize.

i. After two minutes, the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased by no more than 0.5 psig. At a reading of 3.5 psig (plus required groundwater adjustment not to exceed 9.0 psig), timing shall commence. The watch or timing device shall be stopped and read when the pressure drops 1.0 psig and the time (in seconds) shall be recorded.
j. If the time shown in Table 4 for the designated pipe size and length elapses before the air pressure drops 1.0 psig, the section undergoing testing shall have passed and shall be presumed to be free of defects. If the section fails to meet these requirements, the Contractor shall determine at its own expense the source or sources of leakage, and shall repair or replace all defective materials and/or workmanship to the satisfaction of the Owner. The completed pipe installation shall then be retested until the requirements of this test are met.

Table 4

AIR TEST TABLE
(Based on ASTM F1417)

Minimum Test Time in Minutes: Seconds
For Pressure Drop from 3.5 to 2. Psig (Minus Groundwater Influence)

<table>
<thead>
<tr>
<th>Pipe Dia., In.</th>
<th>Minimum Time, Min.</th>
<th>Length for Minimum Time, Ft.</th>
<th>Time for Longer Lengths</th>
<th>Specification Time for Length (L) Shown, minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100 Ft</td>
</tr>
<tr>
<td>4</td>
<td>3:46</td>
<td>597</td>
<td>0.380L</td>
<td>3:46</td>
</tr>
<tr>
<td>6</td>
<td>5:40</td>
<td>398</td>
<td>0.854L</td>
<td>5:40</td>
</tr>
<tr>
<td>8</td>
<td>7:34</td>
<td>398</td>
<td>1.520L</td>
<td>7:34</td>
</tr>
<tr>
<td>18</td>
<td>17:00</td>
<td>133</td>
<td>7.692L</td>
<td>17:00</td>
</tr>
</tbody>
</table>

2. **Infiltration** – (when directed by the Owner)
   
a. Infiltration Test – will be conducted if the Contractor proves to satisfaction of the Owner that the water table is high enough to conform to the requirements noted below.

   The level of the groundwater shall be at least 4 feet above the top of the sewer line along the entire section of the pipeline to be tested. Measurements shall be made every hour for three hours to determine the amount of infiltration.

b. Infiltration shall not exceed 25 gallons per day per mile of sewer per inch of pipe diameter. There shall be no visible leaks.

3. **Deflection Tests** - PVC gravity sewer mains will be subject to a pass/fail test for diametric deflection. Deflection shall not exceed 5 percent of the inside diameter of the pipe. After installation and backfill of sewers, tests will be conducted by pulling a rigid gauge through the sewer from manhole to
manhole or manhole to main line cleanout. Any section of sewer which fails to pass the gauge along its entire length is deemed to have failed the test. Gauge used is subject to approval by the Inspector. The Contractor will conduct the tests, witnessed by the Inspector.

4. **Mirror Tests** - Gravity sewers shall have an internal visual test for proper grade and alignment. The test will consist of directing light through the sewer from manhole to manhole to visually inspect grade, alignment, materials, and defects. Lines are subject to failure for vertical or horizontal misalignment, improper materials, or visible defects. Tests will be conducted by the Inspector with the assistance of the Contractor.

5. **Post-Installation Cleaning and Televising of Sanitary Sewer Mains**
   a. The post-installation TV inspection shall not be completed until all work, including service laterals, manholes, and main line cleanouts are complete on a section of line. The post-installation NEZTEK compliant TV inspection DVD shall be submitted to the Owner prior to substantial completion, or when requested.
   
   b. The post-installation NEZTEK compliant TV inspection shall be completed to confirm completion of the work and to verify that the work conforms to the requirements of the Drawings and Project Manual. Provide a color video DVD showing the completed work, including the condition of service connections. Prepare and submit Television Inspection Logs providing location of service connections along with location of any discrepancies. Manhole work, including, benches, inverts and pipe penetrations into manhole, shall be complete prior to post-installation TV work.
   
   c. For post-installation TV inspection, exercise the full capabilities of the camera equipment to document the completion of the rehabilitation and replacement work and the conformance of the work to the Drawings and Project Manual. Provide a full 360 degree view of pipe, joints and service connections.
   
   d. For sewer point repairs, the entire line section of pipe shall be cleaned and televised from manhole to manhole.

6. **Repairs** - When sewers or manholes fail to meet test requirements, or when leaks, offset or gapped joints, pipe sags, crooked pipe, or other defects are visible by inspection, the Contractor shall repair or rebuild at his expense those portions of the sewers and/or manholes which are faulty. Methods and materials used for repairs shall be approved by the Owner. The tests and repairs shall be continued until the system meets all test requirements.
7. **Manhole Testing** – All manholes shall be vacuum tested by the Contractor prior to acceptance.

a. **Vacuum Test**:

   (1) The vacuum test shall be in accordance with ASTM C1244.

   (2) All pipe entries into the manhole shall be plugged. The compression band of the manhole vacuum testing equipment shall be inflated to effect a seal between the vacuum equipment base and the top of the manhole.

   (3) Ten (10”) inches of mercury shall be applied to the manhole and the time measured for the vacuum to drop from 10” to 9” shall be recorded. The test duration for a 48” diameter manhole is 60 seconds; the test duration for a 60” diameter manhole is 75 seconds.

b. If the vacuum drop is greater than 1” of mercury during the test period, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test.

c. **Acceptance Tests for Force Main**

   1. The Contractor shall supply the pumps, water, temporary buttressing for testing purposes, gages and meters calibrated within 90 days of the test, and all the necessary apparatus and labor. The Contractor shall notify the Owner at least 24 hours in advance of the test date and perform tests in presence of the Inspector. Tests shall be conducted in accordance with ANSI/AWWA C600.

   2. After thrust restraint has been installed and the line has been backfilled and at least seven days after the last concrete reaction anchor has been poured, subject the line or any valved section of the line to a hydrostatic pressure test. The test shall be conducted in the presence of the Inspector. Fill the system with water at a velocity of approximately one foot per second while necessary measures are taken to eliminate all air. Existing City of Virginia Beach valves may only be opened and closed by or under the direct supervision of the Owner. There shall be no direct connection between the City of Virginia Beach potable water system and the line being tested. The Contractor shall maintain an air gap or provide an approved backflow preventer on the water source. After the system has been filled, raise the pressure by pump to 150 psi, plus or minus 5 psi. The test shall be of two-hour duration. Lines of different sizes shall be tested separately. Valves preceding kicker joints shall be in the open position. Pressure shall be applied at intervals not to exceed 2000 feet.
Note: For connections to HRSD sanitary force mains, only retainer glands, tie rods, joint harnesses, or lock-type feature joints shall be used. Concrete thrust blocks shall not be used within the restrained length required for a tapping sleeve or tee. After completion of the thrust restraint, the city force main shall be tested at 150 psi prior to the final connection to the HRSD force main.

3. Each valved section of pipe shall be filled slowly with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Inspector. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. Allow the system to stabilize at the test pressure before conducting the leakage test. All taps for testing shall be at least 1” After completion of testing the corporation stops shall be turned off and capped.

4. Before applying the specified test pressure, air shall be expelled completely from the pipe and valves. If permanent air vents are not located at all high points, the Contractor shall install permanent air vents and corporation stops at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation stops shall be closed and test pressure applied. At the conclusion of the pressure test, the corporation stops shall be turned off and capped.

5. Any exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings or valves that are discovered following the hydrostatic pressure test or leakage test shall be repaired in a manner approved by the Owner or replaced with sound material, and the test shall be repeated until it is satisfactory to the Inspector. Bell repair clamps shall not be permitted as a repair method.

6. A leakage test shall be conducted concurrently with the hydrostatic pressure test. The leakage test shall be performed with a calibrated water meter, calibrated pressure gauge, measured container, pump and water. The Contractor shall provide certification of calibration of testing devices indicating devices were calibrated within 90 days of actual tests. All equipment etc. shall be approved by the Inspector prior to performance. Leakage is defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof, to maintain pressure within, plus or minus 5 psi of the specified test pressure, after air in the pipeline has been expelled, and the pipe filled with water. There shall be no direct connection between the City of Virginia Beach potable water system and the line being tested. The Contractor shall maintain an air gap or provide an approved backflow preventer on the water source. Leakage shall not exceed
that quantity obtained by the formula below. If leakage exceeds that
determined by the formula, find and repair the leaks and repeat the tests until
successful. The leakage formula shall be as follows.

For all material types except welded steel:

\[ L = SD \times (\sqrt{P}) \div 133,200 \]

where \( L \) = allowable leakage in gallons per hour

\( S \) = length of pipeline tested in feet

\( D \) = nominal diameter of the pipe in inches

\( P \) = average test pressure during leakage test in PSIG

Allowable Leakage per 1000 ft. (305m) of pipeline - gph*

Nominal Pipe Dia.

<table>
<thead>
<tr>
<th>Test pressure psi (Bar)</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>24</th>
<th>30</th>
<th>36</th>
<th>42</th>
<th>48</th>
<th>54</th>
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<tbody>
<tr>
<td>150 (10)</td>
<td>0.37</td>
<td>0.55</td>
<td>0.74</td>
<td>0.92</td>
<td>1.10</td>
<td>1.47</td>
<td>1.84</td>
<td>2.21</td>
<td>2.76</td>
<td>3.31</td>
<td>3.86</td>
<td>4.41</td>
<td>4.97</td>
</tr>
</tbody>
</table>

* To obtain leakage in liters/hour, multiply the values in the Table by 3.785

7. When testing against closed metal-seated valves, an additional leakage per
closed valve of 0.0078 gal/h/in (0.0012 L/H/mm) of nominal valve size shall
be allowed.

8. All visible leaks shall be repaired regardless of the amount of leakage.
meter - inches

9. No leakage will be allowed for any welded steel pipe. If leaks are revealed
by test, repair by re-welding. Peening of leaks with a hammer will not be
allowed.

10. If any test of pipe laid discloses defects due to hydrostatic pressure test or
leakage greater than that specified above, the Contractor shall, at his own
expense, locate and make repairs in a manner approved by the Owner and
perform tests again until results are within allowable limits.

520.05 - Shutdowns

Shutdowns for connection to or offsetting of existing utilities shall be coordinated directly through
the Inspector and shall be done at night, unless otherwise specified by the Owner.

Phases of construction which involve the temporary interruption of essential services shall be
scheduled in consultation with the Owner and shall not be of longer duration than essential to
accomplish the purpose for such interruptions. Liaison with Owner in this matter shall be a salient
feature of this Contract.
(a) **Project Coordination**

1. The Contractor shall coordinate his construction plan with the Owner and shall obtain their approval as to date of work, permits, type of temporary patching, traffic control, type and placement of traffic controls, safety devices, and flagmen.

2. Existing City of Virginia Beach valves may only be opened and closed by or under the direct supervision of the Department of Public Utilities Operations personnel or the Inspector. The only exception is an emergency situation affecting public health or safety.

3. Any Contractor found violating this provision may be subject to prosecution under the Code of Virginia Beach for tampering with City of Virginia Beach property.

(b) **Hydrant Service Signs** shall be placed by the Contractor on existing hydrants temporarily taken out of service, as directed by the Inspector. Such signs shall remain in place until removal is approved by the Inspector.

(c) **Valve Operating Service** - When the Contractor requires valve operating services, for other than system shutdowns for offsets or tie-ins, e.g. fire hydrant relocations and service connection relocations, the Contractor shall verbally inform the Department of Public Utilities Inspections Office. The request shall be delivered to the office of the Public Utilities Inspections Office at least 48 hours in advance of the service.

(d) **Abandonment** - Where existing water mains are proposed for abandonment in this Contract, the Contractor will only be permitted to perform “cut and plug” operations on Monday through Thursday. In addition, where portions of the water distribution system must be shut down to facilitate plugging of a line, the Contractor will be required to perform this work at night between the hours of 12:00 midnight and 6:00 A.M. Furthermore, the Owner does not guarantee a 100 percent shutdown of the distribution system should a shutdown be necessary. The Contractor shall, in the preparation of his bid, anticipate cut and plug operations having to be worked with the system under partial pressure and adjust his bid accordingly.

(e) **Shutdown** - When required for cutting-into or offsetting of an existing water main or force main, shutdown will be coordinated directly through the Inspector. The Contractor shall comply with the following in performing a cut-in or offset:

1. The Contractor shall verbally inform the Department of Public Utilities Inspections Office and in writing shall provide them with five working days advance notice when scheduling the work. Scheduling of tie-ins and offsets will be approved at the discretion of the Owner. The written and dated request shall be delivered to the Public Utilities Inspections Office at least
five working days in advance of the service. When more than five working days’ notice is deemed necessary by the Owner, the length of such notice shall be as shown on the construction plans. The Owner reserves the right to cancel the shutdown if conditions warrant, (i.e., heavy rain, main break, etc.).

2. Night-time water main shutdowns will be permitted Monday through Thursday, exclusive of city holidays. Day-time water main shutdowns will be permitted Monday through Friday, exclusive of city holidays, between 9:00 A.M. and 3:00 P.M.

3. Sanitary sewer force main and sewer pump station shutdowns will be permitted Tuesday through Thursday, exclusive of city holidays.

4. The operation of all existing valves will be performed by the Department of Public Utilities Operations personnel.

(f) Offset or Cut-in

1. Prior to performing an offset or cut-in, a trial shutdown may be performed to determine the working conditions to be encountered when the work is performed. The Owner does not at any time guarantee the Contractor a 100 percent positive shutdown.

2. All bends, valves, sleeves, pipe, and fittings shall be fully restrained with retainer glands. Offsets that require connection to an existing cast iron water main shall require a full joint of ductile iron class 52 to extend from the offset in each direction.

3. All water main shutdowns shall be scheduled to minimize service disruption. At the discretion of the Public Utilities Operations Division Water Distribution, shutdowns may be scheduled during the day from 9:00 A.M. to 3:00 P.M. Tuesday through Thursday, or at night from midnight to 6:00 A.M., Monday through Thursday, exclusive of City observed Holidays. Factors that will be considered in scheduling outages will includes, but are not limited to, work area traffic flows, commercial and public facilities use, and size of affected area. In areas where essential service interruption is of concern, outage hours may be restricted from 2:00 A.M. to 6:00 A.M. The excavation for a daytime shutdown shall be completed to the satisfaction of the inspector prior to the schedule shutdown.

Excavation for a nighttime shutdown shall be completed to the satisfaction of the inspector no later than 3:30 p.m. on the day of the shutdown.

All force main shutdowns shall be scheduled to minimize service disruption
and to prevent potential overflow situations. At the discretion of the Public Utilities Operations Division Sewer Collection and Sewer Pump stations, shutdowns may be scheduled during the day from 9:00 A.M. to 3:00 P.M. Monday through Friday, or at night from midnight to 6:00 A.M., Monday through Thursday, exclusive of City observed Holidays. Factors that will be considered in scheduling outages will include, but are not limited to, work area traffic flows, commercial and public facilities use, and system storage capacity. In areas where essential service interruption is of concern, outage hours may be more restrictive. The evacuation for a daytime shutdown shall be completed to the satisfaction of the inspector prior to the schedule shutdown. Excavation for a nighttime shutdown shall be completed to the satisfaction of the inspector no later than 3:30 P.M. on the day of the shutdown.

4. The materials to be installed and the tools to be used for a nighttime shutdown shall be assembled to the satisfaction of the Inspector, no later than 3:30 P.M. on the day of the shutdown. The materials to be installed and the tools to be used for a daytime shutdown shall be assembled to the satisfaction of the Inspector, prior to the scheduled shutdown. The inside of all water system pipe and fittings to be installed shall be cleaned and swabbed with a chlorine solution of 50 mg/l and ends of lines capped until the time of installation. All visible dirt and foreign materials shall be removed from the interior of the pipe and fittings. Immediately prior to installation of the assembly, the pipe and fittings shall again be swabbed with 50 mg/l chlorine solution. The Contractor shall review in detail his plan of operation with the Inspector at the time the excavation and pipe work are inspected for readiness.

5. Excavation around the existing pipe shall be sufficient to allow the work to be performed without requiring additional excavation during installation of the offset or cut-in. Excavation shall be of sufficient depth to accommodate a minimum of 8” uniform depth of VDOT #57 stone which shall be placed by the Contractor over the entire bottom of the excavation. In addition there shall be a minimum of 12” clearance between the bottom of the pipe and the top of the VDOT #57 stone.

6. The Contractor shall clean and mark the location on the existing pipe where the pipe cuts are to be made for the offset or cut-in by 3:30 P.M. on the day of the nighttime shutdown, and prior to the scheduled daytime shutdown. The Contractor shall measure the outside diameter of the pipe to be cut-in to be sure the proposed pipe and fittings are compatible with the existing pipe to be cut. All measurements shall be double checked in the presence of the Inspector just prior to cutting of the existing pipe.
7. All spoil material not used as backfill shall be removed the same day as excavated and approved suitable material to be used as backfill shall be stockpiled in the vicinity of the excavation.

8. The Contractor shall have sufficient crews and equipment on hand to perform the work for each offset. All equipment to be used during the work, including pump, backup pump, backhoe, at least two pipe saws, fuel, tools, generators, light towers, sewage tanker trucks and similar equipment shall be test run and determined to be in proper running order prior to cutting of the existing pipe. If the Contractor fails to provide adequate equipment in proper running order, the Inspector will cancel the work and the Contractor shall request rescheduling when the deficiencies have been corrected.

9. The Contractor shall have on hand at the site of the cut-in or offset two full circle stainless steel repair clamps and two DIMJ plugs or caps as necessary for each size of pipe to be cut. If plugs or caps are used, appropriate thrust restraint shall be provided by the Contractor.

10. After a cut-in or an offset has begun, the Contractor shall make continuous progress toward restoring the water line or sanitary sewer force main to full service. The Contractor shall maintain sufficient crews, equipment, and supplies and shall not leave the work site until the water or sanitary sewer force main work has been completed and restored to complete operation.

11. For water main offsets, the Contractor shall direct his pump discharge in such a manner as to insure drainage away from the excavation so it will not flood streets or adjacent private property.

12. When weather forecasts call for freezing temperatures the night of the cut-in or offset, the Contractor shall have on site sufficient coarse granular sand to spread over all paved areas, sidewalks, and bike paths wetted by the discharge of his pumps and any areas wetted from hydrants flushed to remove air and sediment from the system. During freezing weather, the Contractor shall not wet of paved areas, sidewalks, and bike paths.

13. When bends are used in offsetting around obstructions, a 1” no lead corporation stop shall be installed on each side of the offset to provide air release. After completion, the corporation stop shall be turned off and capped.
(g) Service Interruptions

1. All construction, reconstruction, adjustments, and relocations of existing domestic water services, fire protection services, and domestic pressure sewer services shall be performed in accordance with the conditions given in the section covering offset or cut-in except as specified below.

2. The Contractor shall coordinate the intended service interruptions with the building owner prior to requesting permission from the Department of Public Utilities Inspections Office to make such service interruptions.

3. Thirty-six (36) hours prior to the time the Contractor anticipates interrupting a building's domestic water or sanitary sewer services, the Contractor shall verbally request permission from the Inspector to interrupt such services. Ninety-six (96) hours prior to the time the Contractor anticipates interrupting a building's fire protection services, the Contractor shall verbally request permission from the Inspector to interrupt such service.

4. The Owner will make every reasonable effort to permit the service interruption at the time requested by the Contractor; however, it is not guaranteed that such service interruption will be permitted at the time requested. Temporary services shall be provided by the Contractor as needed for medical or other reasonable reasons. The Contractor shall anticipate such temporary services and it shall be included in his unit price bid for such construction, reconstruction, adjustment, or relocation and shall be provided at no additional cost to the Owner.

5. After permission has been granted by the Owner, the Contractor shall notify the building owner of the anticipated service interruptions and coordinate the work with the building owner. The Contractor shall notify the building owner 24 hours prior to interrupting domestic water or domestic sewer services. The Contractor shall notify the building owner 72 hours prior to interrupting fire protection services.

6. After a service interruption has been started, the Contractor shall make continuous progress toward restoring full service to the building. The Contractor shall maintain sufficient crews, equipment, and supplies and shall not leave the work until the domestic water, sewer, or fire protection service has been fully restored and has been returned to complete, uninterrupted operation.

7. All work performed downstream of the meter or detector check shall be accomplished by the Contractor in accordance with the requirements of the Virginia Beach Department of Planning/Division of Permits and Inspections. All work performed upstream of gravity sewer cleanout structures or upon all portions of a private pressure sewer service shall be accomplished by the
Contractor in accordance with the requirements of the Virginia Beach Department of Planning/Division of Permits and Inspections.

(h) **Backfilling** - After inspection of the pipe work installation by the Inspector, once the main has been placed back in service, pipe to remain has been properly abandoned, and operating pressure restored, the Contractor shall backfill the excavation prior to leaving the job site. If the excavation for the cut-in or offset is within the limits of the roadway, then in addition to backfilling the excavation the Contractor shall provide a pavement patch in accordance with the Contract Documents.

(i) **Responsibility**

1. The Contractor shall be responsible for any additional expense incurred by the Owner from his failure to comply with the aforementioned requirements. All work shall be performed in accordance with the requirements of the Contract Documents.

2. The Contractor shall anticipate the additional expense in performing these operations at night. No claims for additional compensation shall be made by the Contractor for performing these operations outside normal working hours.

520.06 - **Method of Measurement**

Excavation and disposal of unsuitable material will not be measured for separate payment, but the cost thereof shall be included in the price bid for the item to which it pertains.

Unless specifically stated otherwise on the construction plans, measurement and payment for adjustment of existing facilities shall be one time only for each item adjusted. Interim adjustments and/or re-adjustments to facilitate contractor's construction practices shall be included in the amount bid for each item.

Restoration of Property will not be measured separately and shall be considered incidental to other items and the cost thereof shall be included in the price bid for those items.

Removal of existing piping, cleanouts, manholes, and plugging of pipes, etc. shown on the construction plans to be removed and/or plugged shall not be measured for payment when such removals are necessary for the installation of new or relocated water or sewer facilities. Costs for such work shall be considered incidental to the work on the pay items unless specifically stated otherwise.

Hydrant service signs on existing hydrants being temporarily taken out of service will not be measured for separate payment and shall be considered incidental to other items and the cost thereof shall be included in the price bid for those items.
(a) **Relocation of Existing Fire Hydrants** shall be measured in units of each installed.

(b) **Water Mains (4-inches and larger)** shall be measured based upon the linear footage of pipe installed measured along the horizontal plane of the ground or paved surface. Pipe will be measured through fittings and valves.

(c) **Valves and Valve Boxes for Water and Sanitary Sewer Force Mains (4-inches and Larger)** shall be measured for each size based upon the number of each installed.

(d) **Adjustment of Existing Fire Hydrants** shall be measured in units of each adjusted.

(e) **Fire Hydrants** shall be measured for payment based upon the number of each installed.

(f) **Tapping Sleeves and Valves** shall be measured for payment based upon the size and number of each installed.

(g) **Water Service Lines (less than 4-inches)** shall be measured for payment for each size based upon the number of service lines installed.

(h) **Water Meter Boxes and Meter Vaults** shall be measured for payment based upon the number of boxes and vaults of each size installed.

(i) **Cutting in of Tees, Crosses, and Valves into Existing Mains Larger than 2-inches** shall be measured for payment based upon the size and number of each tee, cross, or valve cut in.

(j) **Plugging Existing 2-inch Water Mains** shall be measured for payment based upon each plug installed.

(k) **Gravity Sanitary Sewer Lines (6-inches and Larger)** shall be measured in-place for each size and material in the horizontal plane, from center to center of structure through service wyes and tees, and shall be paid for by the linear foot according to the average depth between structures. The average plan depth is defined as the average of the plan depth (rim to invert) of the upstream and downstream structure on a pipe run. The applicable depth categories are as follows: 0’-6’, 6’-12’, 12’-16’, 16’-20’, and 20’ and over. Where the average depth between structures is determined to be exactly equal to the upper and lower limits of two categories, the depth shall be classified in the category of greater depth.

(l) **Service Wyes or Tees** shall be measured for each service wye or tee installed.

(m) **Lateral Service Connections (4-inch and 6-inch)** shall be measured for each complete connection installed for each size and material.
(n) **Sanitary Sewer Cleanout Assemblies (mainline or lateral)** shall be measured per assembly installed.

(o) **Low Pressure Force Main (3 inch and smaller)** shall be measured based upon the linear footage of pipe installed, measured along the horizontal plane of the ground or paved surface. Pipe will be measured through fittings, and valves.

(p) **Low Pressure Force Main Flushing Chamber** shall be measured for each connection complete and in-place according to size, and per construction plans.

(q) **Low Pressure Force Main Connection** shall be measured for each connection complete and in-place according to size, and per construction plans.

(r) **Ductile Iron Force Mains (4-inches and larger)** shall be measured based upon the linear footage of pipe installed with required coating, measured along the horizontal plane of the ground or paved surface. Pipe will be measured through fittings, valves, and with encasement.

(s) **Air Vent/Blow Off Assemblies (2-inch) for Sanitary Sewer Force Mains and Water Mains** shall be measured for each installed.

(t) **Standard Sanitary Sewer Manholes** shall be measured based upon the vertical linear footage for standard manhole, with manhole inserts, installed and does not include manhole frame & cover.

(u) **Large Sanitary Sewer Manholes (larger than standard 4-foot inside diameter)** shall be measured based upon the vertical linear footage of each diameter manhole, with manhole inserts, installed and does not include manhole frame & cover.

(v) **Drop Manhole Connections** shall be measured for each connection complete and in-place according to size, 4-inch and larger.

(w) **Special Design Sanitary Sewer Manholes** shall be measured for each special design installed in accordance with Contract Documents.

(x) **Manhole Frames and Covers** shall be measured for each frame and cover installed.

(y) **Pipe Bedding** shall be measured in linear feet and shall include bedding material required from 6” below bottom of pipe to the springline of pipe as shown on the construction plans, when directed by the Inspector, for the full width of the trench.

(z) **Coarse Aggregate Fill (VDOT #57 Aggregate) required to replace unsuitable material in water and sanitary sewer pipe trenches below any required pipe bedding** shall be furnished, when directed by the Inspector, to the full width of the trench. It shall be measured in linear feet per each 6-inch increment of depth in-place.
(aa) **Pavement Patching of Utility Trenches** shall be measured in units of linear feet. Pavement shall be measured and paid for one time only. Additional pavement patching required for testing purposes and temporary connections for sanitary sewer and water service lines will not be measured for payment. Measurement shall be made continuous through structures.

(bb) **Concrete Encasements for Valve Boxes** shall be measured in units of each 24” x 24” x 6” encasement installed.

(cc) **Abandonment of Air Vent/Blow Off Assemblies** shall be measured in units of each abandoned.

(dd) **Deflection of Water Mains or Sanitary Sewer Force Mains (in-place)** shall be measured based upon the linear footage of pipe deflected through the horizontal plane.

(ee) **Adjustment of Existing Valve Boxes** shall be measured for each valve box adjusted.

(ff) **Installation of Water or Sanitary Sewer Valve Extension Stem on Existing Valves** shall be measured in units of each extension installed.

(gg) **Offset of Existing Water Main or Sanitary Sewer Force Main** shall be measured based upon the linear footage of pipe installed in the adjustment measured along the centerline or horizontal plane of the ground or paved surface. Pipe will be measured through valves and fittings.

.hh) **Adjustment of Existing Sanitary Sewer Manhole Frame and Cover** shall be measured in units of each adjusted.

(ii) **Adjustment of Existing Air Vent/Blow Off Assemblies** shall be measured in units of each adjusted.

(jj) **Reconstruction of Existing Sanitary Sewer Manholes** shall be measured in units of each reconstructed.

(kk) **Adjustment of Existing Sanitary Sewer Cleanouts** shall be measured in units of each adjusted.

(ll) **Relocation of Existing Water Meter and Box or Detector Check and Vault Box** shall be measured in units of each relocated.

(mm) **Adjustment of Existing Water Meter and Box or Detector Check and Vault Box** shall be measured in units of each adjusted.
(nn) Removal of Existing Water Meter, Box, and Service Line shall be measured in units of each removed.

(oo) Removal of Existing Sanitary Sewer Cleanouts shall be measured in units of each removed.

(pp) Removal of Existing Water and Force Main Valves shall be measured in units of each removed.

(qq) Relocation of Existing Sanitary Sewer Cleanouts shall be measured in units of each relocated.

(rr) Abandonment of Existing Sanitary Sewer Manholes shall be measured in units of each abandoned.

(ss) Abandonment of Existing Sanitary Sewer Mains, Force Mains, or Water Mains shall be measured for each size in the horizontal plane, from center to center of structure and shall be paid for by the linear foot.

(tt) Select Material Used in Trench Backfilling shall be measured in cubic yards. To determine the volume, length shall be measured in the horizontal plane through fittings, valves or between the centers of structures. Depth and width will be determined as described below. Select material used for water service lines and sanitary sewer laterals will not be measured for payment.

The volume for payment is determined by the amount of select material displaced by pipes deducted from the total trench volume and any on site suitable material deducted from the total trench volume. For water or force mains: Depth shall be measured from the pipe invert to the top of the unsuitable material, or to the finished grade elevation less the thickness of the pavement structure specified by the construction plans, whichever is applicable. The maximum width shall be calculated by taking the nominal pipe diameter plus 2.5 feet.

For gravity sewers: Depth categories are: 0’-6’, 6’-12’, 12’-16’, 16’-20’ and 20’ and deeper. The maximum trench width shall vary as a function of depth:

<table>
<thead>
<tr>
<th>Depth from Existing Ground to Invert</th>
<th>Pay Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>0’-6’</td>
<td>4.0’</td>
</tr>
<tr>
<td>6’-12’</td>
<td>5.5’</td>
</tr>
<tr>
<td>12’-16’</td>
<td>7.0’</td>
</tr>
<tr>
<td>16’-20’</td>
<td>8.0’</td>
</tr>
<tr>
<td>Greater than 20’</td>
<td>10.0’</td>
</tr>
</tbody>
</table>

(uu) Post Installation Cleaning & Televising of Sanitary Sewer Mains shall be measured based upon the linear feet of pipe cleaned and televised.
(vv) **Pre-construction TV** shall be NEZTEK compliant and will include normal cleaning (up to two passes), and shall be measured by the lineal foot from center of manhole to center of manhole.

(ww) **Test Pits** shall be measured in units of each.

520.07 - Basis of Payment

The Cost of providing and maintaining adequate and safe passage over excavations for the purpose of accommodating pedestrians or vehicles as directed by the Inspector shall be included in the price bid for other items.

All Costs for containing or pumping sewage including pump station wet wells during adjustment of or connection to existing sewers shall be included in the price bid for other items.

All Costs for disinfecting the water lines and appurtenances, and existing water line stubs and kicker joints, shall be included in the price bid for such water lines and appurtenances.

All Costs for 1-inch corporation stops for testing, chlorination, and venting during construction are incidental to the work being performed and shall be included in the price for pipe installation.

(a) **Relocation of Existing Fire Hydrants** shall be paid for at the contract unit price per each, which price shall be full compensation for handling and storage, cleaning, dewatering, excavating, necessary coarse aggregate fill, relaying, sterilizing, testing, backfilling with suitable material, compacting, necessary cutting or joining to other sections of pipe, including additional sections of pipe, bends, and thrust protection, adjusting to final grade, painting as per detail, disposing of surplus or unsuitable material, topsoiling, seeding, other site restoration and cleanup of property, hydrant service sign, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work.

(b) **Water Mains (4-inches and larger) (Size and type)** shall be paid for at the unit prices bid for each size and shall include the cost of furnishing and installing the pipe, fittings such as tees, bends, reducers, sleeves, plugs, caps, as well as other appurtenances not specifically measured for payment; dewatering, excavating, temporary sheeting and bracing, thrust protection, backfilling, compacting, testing, disinfecting, topsoiling, seeding, disposing of surplus material, and other site restoration and cleanup is included.

Note: CBR-18 Select material shall be used for trenches made in the subgrade of proposed or existing pavement, and all trenches outside of the subgrade where the inner edge of the trench is closer than two feet to the edge of the proposed pavement, stabilized shoulder, curb, bikepath, or sidewalk, whether such backfill material supplied from onsite or offsite. Pipe bedding, when directed by the Inspector, shall
be paid for under pipe bedding. Coarse aggregate fill, when directed by the Inspector, shall be paid for under coarse aggregate fill.

(c) **Valves and Valve Boxes for Water and Sanitary Sewer Force Mains (4-inches and larger) (Size and type)** shall be paid for at the unit prices bid for each size and shall include the cost of furnishing and installing the valve, valve box and lid, fittings, restraint, and valve extension as required. The cost of other items such as excavating, backfilling, compacting and other items required for installing pipelines shall be measured and paid as part of the unit price for such pipelines.

(d) **Adjustment of Existing Fire Hydrant** shall be paid for at the contract unit price bid for each, which price shall be full compensation for fire hydrant of appropriate height, dewatering, excavating, removing existing hydrant, handling, storing, cleaning, disinfecting, reinstalling, necessary cutting or joining to other sections of pipe, painting as per detail, necessary coarse aggregate fill, backfilling with suitable material, compacting, adjusting to final grade, testing, top soiling, seeding, disposing of surplus or unsuitable material, restoration and cleanup of property and for furnishing all materials, labor tools, equipment and incidentals necessary to complete the work.

(e) **Fire Hydrants** shall include installation, fittings, thrust protection, testing, adjustment to final grade, painting as per detail, hydrant service sign, and coarse aggregate fill. The unit price does not include pipe, valve, and valve box which shall be paid for under their respective unit price.

(f) **Tapping Sleeves, Valves and Boxes (Size)** shall include field verification that the sleeve will fit the existing pipe as well as the cost of the sleeve, valve, valve box and lid, valve extension, as required, installation, testing, tapping the main.

(g) **Water Service Lines (less than 4-inches) (Size)** shall include the cost and installation of corporation stops, pipe, fittings, meter valves, testing, backfilling with suitable material, compacting, coarse aggregate fill, pavement replacement, top soiling, seeding, disposing of surplus or unsuitable material, and other site restoration and cleanup, and, where applicable, connection or transfer to new or existing water meters or services.

(h) **Water Meter Boxes and Meter Vaults (Sizes and vaults)** shall be paid based upon the number of boxes and vaults of each size installed, including the cost of excavating, backfilling with suitable material, compacting, top soiling, seeding, disposing of surplus or unsuitable material, and other site restoration and clean-up. And all other components required for complete and satisfactory operation.

(i) **Cutting in of Tees, Crosses, and Valves into Existing Mains (larger than 2-inches) (Size)** shall be paid based upon the number of each tee, cross, or valve cut in. The unit price bid shall include the cost of furnishing and installing all fittings such as tees, bends, reducers, sleeves, plugs, as well as other appurtenances,
dewatering, excavating, temporary sheeting and bracing, thrust protection, testing, backfilling with suitable material, compacting, coarse aggregate fill, pavement replacement, top soiling, seeding, disposing of surplus or unsuitable material, and other site restoration and cleanup, and shall include the cutting-in of any valves at or near the tee or cross. The unit price bid shall not include pipe or valves and valve boxes, which shall be paid for under their respective unit price.

(j) **Plugging Existing 2-inch Water Mains** shall be paid based upon each plug installed. The unit price bid shall include the cost and installation of plugs, couplings, excavating, thrust protection, backfilling with suitable material, compacting, coarse aggregate fill, pavement replacement, top soiling, seeding, disposing of surplus or unsuitable material, other site restoration and cleanup, and cutting the existing main as shown on construction plans.

(k) **Gravity Sanitary Sewer Lines (6-inches and larger) (Size, type and depth)** shall be paid for at the unit price for each size and depth bid and shall include the cost of furnishing and installing the pipe, dewatering, excavating, temporary sheeting and bracing, testing, backfilling, compacting, top soiling, seeding, disposing of surplus or unsuitable material, and other site restoration and cleanup.

Note: CBR-18 backfill material shall be used for trenches made in the subgrade of proposed or existing pavement, and all trenches outside of the subgrade where the inner edge of the trench is closer than two feet to the edge of the proposed pavement, stabilized shoulder, curb, bike path, or sidewalk, whether such backfill material supplied from onsite or offsite. Pipe bedding, when directed by the Inspector, shall be paid for under pipe bedding. Coarse aggregate fill, when directed by the Inspector, shall be paid for under coarse aggregate fill.

(l) **Service Wyes or Tees (Size)** shall be paid for at the Contract unit price. Excavation and backfill for service wyes or tees shall be included in the measurement and payment for gravity sanitary sewer lines. Price for service wye or tee shall be in addition to the footage payment for the main line pipe.

(m) **Lateral Service Connections (4-inch and 6-inch) (Size and type)** shall be paid for at the Contract unit price and shall include all pipe, appurtenances, dewatering, excavating, testing, backfilling with suitable material, compacting, aggregate base stone, pavement replacement, top soiling, seeding, disposing of surplus or unsuitable material, and other site restoration and cleanup. Wye or tee at main sanitary sewer line shall be measured and paid for separately.

(n) **Sanitary Sewer Cleanout Assemblies (mainline or lateral)** shall be vertical and will include furnishing and installing the wye, riser pipe, solid sleeve, the cast iron cleanout with cover, Cherne Cleanout 4” Gripper Plug, Part #270188 dewatering, excavating, backfilling with suitable material, compacting, top soiling, seeding, disposing of surplus or unsuitable material, and other restoration and cleanup. For main line cleanout assemblies, concrete, bricks, and frame & cover shall be included.
(o) **Low Pressure Force Mains (3 inches and smaller)** shall be paid for at the unit prices bid for each size and shall include the cost of furnishing and installing the pipe, fittings such as tees, bends, reducers, sleeves, plugs, caps, corporation stop, as well as other appurtenances, the cost of excavating, temporary sheeting and bracing, dewatering, thrust protection, backfilling, compacting, testing, disposing of surplus material, top soiling, seeding, and other site restoration and cleanup.

Note: CBR-18 backfill material shall be used for trenches made in the subgrade of proposed or existing pavement, and all trenches outside of the subgrade where the inner edge of the trench is closer than two feet to the edge of the proposed pavement, stabilized shoulder, curb, bikepath, or sidewalk, whether such backfill material supplied from onsite or offsite. Pipe bedding, when directed by the Inspector, shall be paid for under pipe bedding. Coarse aggregate fill, when directed by the Inspector, shall be paid for under coarse aggregate fill.

(p) **Low Pressure Force Main Flushing Chamber** shall be paid in units of each installed.

(q) **Low Pressure Force Main Connection** shall be paid in units of each installed.

(r) **Ductile Iron Force Mains (4-inches and larger)** shall be paid for at the unit prices bid for each size and shall include the cost of furnishing and installing the pipe, fittings such as tees, bends, reducers, sleeves, plugs, caps, corporation stop, as well as other appurtenances, the cost of excavating, temporary sheeting and bracing, dewatering, thrust protection, backfilling, compacting, testing, disposing of surplus material, top soiling, seeding, and other site restoration and cleanup.

Note: CBR-18 backfill material shall be used for trenches made in the subgrade of proposed or existing pavement, and all trenches outside of the subgrade where the inner edge of the trench is closer than two feet to the edge of the proposed pavement, stabilized shoulder, curb, bikepath, or sidewalk, whether such backfill material supplied from onsite or offsite. Pipe bedding, when directed by the Inspector, shall be paid for under pipe bedding. Coarse aggregate fill, when directed by the Inspector, shall be paid for under coarse aggregate fill.

(s) **Air Vent/Blow Off Assemblies for Sanitary Sewer Force Mains and Water Mains** shall be paid for at the Contract unit price for each and shall include all fittings, valves, vent pipes, plugs, pipe, pipe nipples, corporation stop, concrete, bricks, frame and cover, and other components required for complete and satisfactory operation.

(t) **Standard Sanitary Sewer Manholes** shall be paid based upon the vertical linear footage for standard manhole, with manhole insert, installed. Depth for payment purposes shall be from the invert at the center of the sewer manhole, to the bottom of the manhole casting. The Contract unit price for each vertical linear foot shall include the cost of excavating, coarse aggregate fill, backfilling with suitable
material, compacting, and temporary sheeting and bracing, dewatering, interior and exterior applied coatings, concrete base, benches, inverts, disposing of surplus or unsuitable material, and connection of sanitary sewer lines to the manhole.

(u) **Large Sanitary Sewer Manholes (larger than standard 4-foot inside diameter)** shall be paid based upon the vertical linear footage of each diameter manhole, with manhole insert, installed, with payment as set forth above for standard sewer manholes. The contract unit price for each vertical linear foot shall include the cost of excavating, coarse aggregate fill, backfilling with suitable material, compacting, and temporary sheeting and bracing, dewatering, interior and exterior applied coatings, benches, inverts, disposing of surplus or unsuitable material, and connection of sanitary sewer lines to the manhole.

(v) **Drop Manhole Connections** shall be paid for at the contract unit price for each connection and shall include excavating, coring all materials for construction of drop connection, backfilling with suitable material, compacting, and disposing of surplus or unsuitable material.

(w) **Special Design Sanitary Sewer Manholes** shall be paid for at the contract unit price for each special design in accordance with the Contract Documents.

(x) **Standard Sanitary Sewer Manhole Frame and Cover (Size and type)** shall be paid for at the contract unit price for each frame and cover installed including adjustment to final grade.

(y) **Pipe Bedding** shall be paid for at the contract unit price and shall include the cost of furnishing and installing the pipe bedding as directed by the Inspector, the cost of additional excavation, dewatering, temporary sheeting and bracing, and disposing of the unsuitable material which is replaced by the pipe bedding.

(z) **Coarse Aggregate Fill (VDOT #57 aggregate)** shall be paid for at the contract unit price per 6-inch depth and shall include the cost of furnishing and installing the fill as detailed on the construction plans, the cost of additional excavation, dewatering, temporary sheeting and bracing, and disposing of unsuitable excavated material which is replaced by the coarse aggregate fill.

(aa) **Pavement Patching for Utility Trenches** shall be paid for at the contract unit price per linear foot of pavement replaced. The unit price shall be full compensation for all labor, tools, equipment, materials and incidental necessary to complete the work.

(bb) **Concrete Encasement for Valve Boxes** shall be paid for at the contract price per each. The unit price shall be full compensation for all excavating, form work, backfilling with suitable material, compacting, disposing of surplus or unsuitable material, top soiling, seeding, other site restoration and cleanup, labor, tools, equipment, and incidentals necessary to complete the work.
(cc) **Abandonment of Air Vent/Blow Off Assemblies** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, backfilling with suitable material, compacting, disposing of surplus or unsuitable materials, restoration of property and for furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work as shown on the plans.

(dd) **Deflection of Existing Water Main or Sanitary Sewer Force Main (Size)** shall be paid for at the contract unit price per linear foot for each size. The unit price shall include the cost of excavating, temporary sheeting and bracing, dewatering, testing, coarse aggregate fill, backfilling with suitable material, compacting, disposing of surplus or unsuitable material, top soiling, seeding, pavement replacement, other site restoration and cleanup.

(ee) **Adjustment of Existing Valve Boxes** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, removing of box and cover, replacing sections, backfilling with suitable material, compacting, pavement patching, adjusting to final grade, disposing of surplus or unsuitable materials, top soiling, seeding, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans. Riser rings will not be permitted.

(ff) **Installation of Water or Sanitary Sewer Valve Extension Stem on Existing Valves** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, stem additions, removing and replacing valve box, adjusting to final grade, backfilling with suitable material, compacting, disposing of surplus or unsuitable materials, top soiling, seeding, pavement patching and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans.

(gg) **Offset of Existing Water main or Sanitary Sewer Force Main** shall be paid for at the contract unit price per foot. The unit price shall include the cost of coordinating line shutdown, furnishing and installing the pipe, fittings, dewatering, excavating, temporary sheeting and bracing, pipe bedding, thrust protection, disinfecting, testing, backfilling with suitable material, compacting, cutting of existing line, removing and disposing off-site of old line, top soiling, seeding, disposing of surplus or unsuitable materials, and other site restoration and cleanup.

(hh) **Adjustment of Existing Sanitary Sewer Manhole Frame and Cover** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, removing of frame and cover, adding or removing material from manhole tower, replacing frame and cover, top soiling, seeding, backfilling with suitable material, compacting, adjusting to final grade, disposing of surplus or unsuitable materials and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans. Riser rings will not be permitted.
(ii) **Adjustment of Existing Air Vent/Blow Off Assemblies** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, removing of frame and cover, aligning or removing the length of the 2” brass pipe, replacing frame and cover, backfilling with suitable material, compacting, adjusting to final grade, disposing of surplus or unsuitable materials, top soiling, seeding, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans. Riser rings will not be permitted.

(jj) **Reconstruction of Existing Sanitary Sewer Manholes** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, removing of frame and cover, adding or removing material from manhole tower, adding or removing cone or chamber sections, adding or removing steps as necessary, replacing frame and cover, installing manhole insert, backfilling with suitable material, compacting, adjusting to final grade, disposing of surplus or unsuitable materials and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans.

(kk) **Adjustment of Existing Sanitary Sewer Cleanouts** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, removing of frame and cover, adding or removing material supporting frame, adding or removing pipe, replacing plug, replacing frame and cover, backfilling with suitable material, compacting, adjusting to final grade, disposing of surplus or unsuitable materials, top soiling, seeding, pavement or concrete, as needed. This price shall include furnishing all materials, labor, tools, equipment and incidental necessary to complete the work as shown on the construction plans.

(ll) **Relocation of Existing Water Meter and Box or Detector Check and Vault Box** shall be paid for at the contract unit price per each. The unit price shall be full compensation for all dewatering, excavating, handling and storage, cleaning, installing, necessary cutting or joining to other sections of pipe, additional sections of pipe or service line, sterilizing, testing, backfilling with suitable material, compacting, coarse aggregate fill, adjusting to final grade, disposing of surplus or unsuitable material, top soiling, seeding, restoration of property, and for furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work as shown on the construction plans.

(mm) **Adjustment of Existing Water Meter and Box or Detector Check and Vault Box** shall be paid for at the contract unit price per each. The unit price shall be full compensation for all dewatering, excavating, handling and storage, cleaning, installing, necessary cutting or joining to other sections of pipe, additional sections of pipe or service line, sterilizing, testing, backfilling with suitable material, compacting, coarse aggregate fill, adjusting to final grade, disposing of surplus or unsuitable material, top soiling, seeding, restoration of property, and for furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work as shown on the construction plans.
(nn) **Removal of Existing Water Meter, Box and Service Line** shall be paid for at the contract unit price per each. The unit price shall be full compensation for all dewatering, excavating, backfilling with suitable material, compacting, disposing of surplus or unsuitable material, top soiling, seeding, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans. The water service line shall be detached from the corporation and the corporation turned off and capped. The existing water meter and box shall be removed and delivered to Public Utilities/Operations (3500 Dam Neck Road, Virginia Beach, VA 23456).

(oo) **Removal of Existing Sanitary Sewer Cleanouts** shall be paid for at the contract unit price per each. The unit price shall be full compensation for all dewatering, excavating, backfilling with suitable material, compacting, disposing of surplus or unsuitable material, top soiling, seeding, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans. Where existing cleanouts are to be removed, the wye of the cleanout shall be removed and a plug installed in its place.

(pp) **Removal of Existing Water and Force Main Valves** shall be paid for at the contract unit price per linear foot. The unit price shall be full compensation for all dewatering, excavating, backfilling with suitable material, compacting, disposing of surplus or unsuitable material, top soiling, seeding, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans.

(qq) **Relocation of Existing Sanitary Sewer Cleanouts** shall include installation of a new vertical sanitary sewer cleanout and will be paid for at the contract unit price per each. The unit price shall be full compensation for all dewatering, excavating, backfilling with suitable material, compacting, pavement patching, necessary cutting or joining to other sections of pipe, additional sections of pipe as needed, coarse aggregate fill, testing, disposing of surplus or unsuitable material, top soiling, seeding, restoration of property, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans.

(rr) **Abandonment of Existing Sanitary Sewer Manholes** shall be paid for at the contract unit price per each. The unit price shall be full compensation for excavating, removal of frame & cover, removal of chimney section, demolishing, filling with flowable fill, backfilling with suitable material, compacting, pavement patching, disposing of surplus or unsuitable material, top soiling, seeding, restoration and cleanup of property and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans.
**ss Abandonment of Existing Water and Sanitary Sewer Force Mains, and Gravity Sanitary Sewer Mains** shall be paid for at the contract price per linear foot for each pipe size. The unit price shall be full compensation for excavating, installation of temporary air vents, fill the pipe by pumping with flowable fill, capping or plugging, backfilling with suitable material, compacting, pavement patching, disposing of surplus or unsuitable materials, handling of hazardous materials (i.e., asbestos), topsoiling, seeding, restoration and clean-up of property, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work as shown on the construction plans.

**tt Select Material Used in Trench Backfilling** shall be made at the contract unit price bid per cubic yard of select material. The unit price includes disposing of unsuitable material.

**uu Post Installation Cleaning & Televising of Sanitary Sewer Mains** shall be paid for at the Contract unit price and include all labor, materials, equipment, and waste material removal and disposal.

**vv Pre-construction TV** shall be NEZTEK compliant and will include normal cleaning (up to two passes), and shall be paid by the lineal foot from center of manhole to center of manhole.

**ww Test Pits** shall be paid for at the contract price for each, and will be compensation for all tools, labor, materials, survey equipment, excavation, backfill, pavement removal and disposal, pavement replacement, and incidentals necessary to complete the work.

Payment shall be made under:

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<td>Fire Hydrants</td>
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Abandonment of Existing Sanitary Sewer Mains, Force Mains, or Water Mains | Linear Foot
---|---
Select Material Used in Trench Backfilling | Cubic Yard
Post Installation Cleaning and Televising of Sanitary Sewer Mains | Linear Foot
Pre-construction TV | Linear Foot
Test Pits | Each

520.08 - Submittals and Certification

See Section 105.02.

Certification - The Contractor, with his associated materials suppliers, shall provide certification, to include brand and model number when appropriate, acceptable to the City of Virginia Beach, that all pipe and materials supplied on the project meet or exceed the specifications.

520.09 - Separation of Water Lines and Sanitary Sewers

Follow Department of Health standards for the separation of sanitary sewer and water distribution systems.

(a) Parallel Installation

1. **Normal Conditions**: Water lines shall be constructed at least 10 feet horizontally from a sewer or sewer manhole whenever possible, the distance shall be measured edge-to-edge.

2. **Unusual Conditions**: When local conditions prevent a horizontal separation of at least 10 feet, the water line may be laid closer to a sanitary sewer or sanitary sewer manhole provided that the bottom of the water line is at least 18” above the top of the sanitary sewer.

(b) Crossing

1. **Normal Conditions**: Water lines crossing over sanitary sewers shall be laid to provide a separation of at least 18” between the bottom of the water line and the top of the sanitary sewer whenever possible.

2. **Unusual Conditions**: When local conditions prevent a vertical separation described in Normal Conditions, paragraph above, the following construction shall be used.

   a. Sanitary sewers passing over or under water lines shall be constructed Class 52 ductile iron pipe.
b. Water lines passing under sanitary sewers shall, in addition, be protected by providing:

(1) A vertical separation of at least 18” between the bottom of the sanitary sewer and the top of the water line,

(2) Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking water line,

(3) The length of the water line be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sanitary sewer.

(c) Sanitary Sewers or Sanitary Sewer Manholes

No water pipes shall pass through or come in contact with any part of a sanitary sewer, sanitary sewer manhole, or stormwater pipe or stormwater manhole.

SECTION 522 – TEST PITS - add the following section

522.01 – Description

The work shall consist of performing test pits within the project limits for locating unknown and unmarked underground utilities and/or investigating soil types and conditions before or during construction. This work shall consist of furnishing all labor, material, equipment, testing, submittals tools and equipment necessary to perform the test pit and restoration. To verify the depth and ownership of buried utilities.

Prior to any test pit operation for unknown or unmarked utilities, the Contractor is to review the location, number of test pits and the existing utilities with the Owner. The contractor shall obtain the vertical and horizontal location, measured off of the construction center line or base line, and determine the size and type of the utility line. The unknown and/or unmarked utilities need to be marked on the plans and as-builts shall be given to the Inspector. Photographs shall be provided to document the existence, or absence, of the utilities. Test pits performed without prior authorization from the Owner will be at the Contractor's expense.

Activities necessary to locate known utilities identified within the contract plans and documents in order to perform the contract work are considered incidental to construction and the cost shall be included in the unit price for that item. No separate payment will be made for identifying these utilities without prior authorization from the Owner.
522.02 - Materials

Material for backfill, pavement replacement and restoration of the disturbed area shall be in conformance with the applicable requirements of these specifications.

522.03 - Procedures

(a) **Department of Public Utilities Engineering Division Private Utility Right-of-Way Permit Application Requirements**

1. City of Virginia Beach right-of-way permits are administered by the Department of Planning/Permits and Inspections. A complete copy of the review sheet from Permits & Inspections is routed to the Department of Public Utilities Engineering Division (Public Utilities) for comments. Public Utilities will review each review sheet in relation to the City of Virginia Beach water and sanitary sewer infrastructure including Hampton Road Sanitation District (HRSD) infrastructure. Comments are returned to Permit & Inspections for consideration.

2. When emergency work is required, the permittee must contact Public Utilities/Engineering by telephone (757-385-4171) and provide the location of the emergency and the right-of-way permit number assigned by Permits & Inspections before work commences. A fax notification sheet will also be sent to Public Utilities/Engineering (757-385-5778) with the permit number and location noted. A permit application and drawing (see Part 2) will be required within fourteen (14) days of emergency call in.

Applications routed to Public Utilities for review must contain the following information:

a. Company name

b. Company phone number

c. Company address

d. Contact person name and phone number

e. Contractor name and phone number

f. Type and description of work (including linear footage) to be performed (be specific)

h. Number of test holes and/or number and sizes of open cuts.

Street address / location of work and nearest cross street.
i. Indicate whether proposed utility work is within the limits of a Capital Improvement Project (CIP). If yes, provide CIP job number.

(b) **Right-of-Way Application Drawing**

1. Drawings submitted with a permit application (including emergency work permits) may be on existing site plans, record drawings, drawn by C.A.D., or manually drawn. All drawings shall be neat and legible. NOTE: The use of existing drawings will not eliminate any requirements listed in Section 2.3 below.

2. Scaled drawings are not required but the drawing shall be adequately sized to show the degree of congestion within the limits of all proposed work and all existing utilities.

3. Drawings must show the following for Public Utilities review:
   a. All proposed private utilities (clearly labeled and highlighted).
   b. Property line or right-of-way line (labeled P/L or R/W).
   c. Horizontal distance between right-of-way line (R/W) or public easement line to the nearest existing public utility, horizontal distance between existing public utilities and all proposed utilities (must be referenced from edge of pavement).
   d. Edge of pavement and driveways (labeled EOP and DW)
   e. All water mains, detector checks, fire hydrants, water valves, water meter, gravity sanitary sewer mains, manholes, gravity sanitary sewer services with clean out (if available), sanitary sewer force mains (including HRSD force mains), force main valves, vacuum sanitary sewer mains, valve pits, and service lines.
   f. Diameter of all existing water mains, sanitary sewer mains, force mains, sanitary sewer service laterals, and water services within the proposed work area.
   g. The starting point and point of termination of the proposed private utility or the point where the utility crosses out of the City of Virginia Beach right-of-way or easement, i.e. from pedestal to pole or from pole to property line.
   h. Linear footage of all proposed private utilities within the City of Virginia Beach right-of-way i.e., cable, conduit, or piping.
i. North arrow.

j. Match line station or sheet number, if applicable.

k. Street name with addresses and nearest cross street name.

l. Show all public utility easements within proposed work area.

(c) Right-of-Way Permits

Public Utilities will make every effort to review and return comments to Permits & Inspections within five (5) days. Additional review time may be necessary as a result of permit volume. P.U. reviewers shall notify Permits & Inspections prior to, or on the fifth day, when more review time is required.

(d) Installation of Private Utilities in the City of Virginia Beach Right-Of-Way

1. All work site locations shall be faxed (757-385-5778) or emailed to the Public Utilities’ Engineering Division no later than 9:00 A.M., daily.

2. Proposed utility depth requirements must adhere to the Code of Virginia Section § 56-265.26:1, found in the Virginia Professional Excavator’s Manual.

3. Private utility installations must maintain a minimum 12” (1 foot) vertical edge-to-edge separation and a minimum 36” (3 feet) edge-to-edge horizontal separation from all water and sanitary sewer utilities that are at a depth less than six (6) feet. A vertical separation of 1 foot is allowed only when all proposed utilities are installed utilizing non-mechanized equipment.

When water and sanitary sewer utilities are at a depth greater than six (6) feet, the required horizontal and vertical separation distance will be increased. Additionally, the diameter of water and sanitary sewer utilities may increase horizontal and vertical separation distance.

4. When crossing over or under water and sanitary sewer utilities, the Contractor is required to comply with Section 20VAC5-309-150 titled "Requirements for Trenchless Excavation" found in the Virginia Professional Excavator's Manual. These rules delineate procedures used by the State Corporation Commission to enforce the Underground Utility Damage Prevention Act. The requirement states, "The excavator shall visually check the drill head as it passes through pot holes, entrances, and exit pits; and if the depth indicated by the locating device is lower than the bottom of the pot hole or pit, the excavator shall cease boring until the hole/pit can be hand excavated further to maintain a visual inspection of the
Contractors installing private utilities must notify the Department of Public Utilities’ Engineering Division twenty-four (24) hours in advance to request an appointment for utility depth verification. A Public Utilities Engineering Technician must record the observed depth of all water and sanitary sewer utilities and approve the vertical separation between the Department’s utility and the proposed utility. At no time shall the drill head be allowed to pass the Department's utilities with less than 24” of separation.

For utilities such as deep gravity sanitary sewer mains where performing depth verification by test hole method is not feasible, visually checking the drill head passing through the test hole may not be enforced. The contractor must obtain prior approval and an approved depth in writing from the Department of Public Utilities before crossing water and sanitary sewer utilities if a test hole is not performed.

Public Utilities reserves the right to request additional utility depth verification (test holes) as needed. Permittee shall contact Permits & Inspections for field change authorization.

5. Private utilities must not cross Public Utilities’ water and sanitary sewer facilities diagonally. All crossings must be perpendicular.

6. The HRSD Interceptor Engineer shall be notified forty-eight (48) hours prior to crossing HRSD force mains.

7. Contractor must have a complete copy of the approved right-of-way permit on site, including all attachments and addendums, and a cleared Miss Utility ticket for the permitted work.

8. Contractor must have a complete copy of the Virginia Professional Excavator’s Manual on site at all times and must be familiar with the Underground Utility Damage Prevention Act.

9. Notify Miss Utility (1-800-552-7001) at least forty-eight (48) hours before beginning any installation / construction. The 48-hour period begins at 7:00 A.M. the next day after notifying Miss Utilities. Do not excavate if there is clear evidence of unmarked utilities.

10. If conflicts are discovered between proposed private utilities and existing water and sewer utilities, work shall not commence until all field changes are approved by the Owner. Please refer to Permits & Inspection’s Field Revision Guidelines.

Note: Public Utilities reserves the right to stop work and require a revision field conditions and / or field changes impact water and sanitary sewer utilities.

11. If damage to water or sanitary sewer infrastructure occurs, the Contractor
or authorized representative shall notify Public Utilities Engineering Division (757-385-4171) and the Operations Division (757-385-1400). The private utility company acquiring the permit shall be held responsible for damages due to negligence and the cost associated with the repairs made by Public Utilities.

Note: Contractors shall exercise extreme caution when working around vacuum sanitary sewer systems. Damaging one related service can result in a major service outage. Tracer wire and marking tape are buried with all vacuum sanitary sewer piping. If tracer wire is damaged, notify the Operations Division at the number listed above. If marking tape is damaged, Contractor to replace in kind. Do not attempt to repair any piping, wires, or related appurtenances and do not backfill until notified to do so by Public Utilities. Backfilling may be permitted only if unsafe conditions exist and damaged location is flagged.

12. When permanent restoration is not required due to impending construction activities, the disturbed area will be maintained at grade using materials necessary to provide a safe surface for pedestrian and vehicular traffic.

522.04 - Submittals

The following submittals shall be submitted to the Owner for review and approval prior to installation.

(a) Affidavit and test report for seed mixture, if applicable.

(b) Photos documenting test pits.

522.05 - Measurement and Payment

Test Pits will be measured in units of each and will be paid for at the contract unit price per each. This price shall include full compensation for all tools, labor, materials, survey equipment, construction equipment and incidentals necessary to complete the work.

Payment will be made under:

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<th>Pay Item</th>
<th>Pay Unit</th>
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<td>Test pit with pavement restoration</td>
<td>Each</td>
</tr>
<tr>
<td>Test pit with lawn restoration</td>
<td>Each</td>
</tr>
<tr>
<td>Test pit without restoration</td>
<td>Each</td>
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ROADSIDE DEVELOPMENT
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SECTION 601 – SELECTIVE TREE REMOVAL, TRIMMING, AND CLEANUP

601.01 - Description - replaces the first sentence with the following

This work shall consist of selectively removing, trimming, and disposing of trees, shrubs, and vegetation to improve sight distance, create open vistas, or improve the appearance and condition of trees as shown on the plans, described elsewhere in the Contract, or as directed by the Landscape Architect or Arborist.

601.03 - Procedures - replaces the first sentence in the first paragraph with the following

The contractor shall cut trees and stumps so that remaining stumps are not higher than 2” above the ground.

SECTION 602 - TOPSOIL

602.03 - Procedures - replaces with the following paragraph

(b) Preparing Areas to Receive Topsoil: Unless otherwise directed by the Owner, the Contractor shall grade and shape area designated to receive topsoil shall be graded, shaped, and then scarified or tiled by diskimg, harrowing, or other approved methods to a depth of approximately 4”. Topsoil shall be applied only when the subsoil is in a loose, friable conditions

(c) Applying Topsoil: - replaces with the following paragraph

1. Placement of topsoil: The Contractor will place and spread 4” of Class A or Class B topsoil on entire site within the limits of work or as otherwise noted on plans.

2. Grade topsoil to eliminate rough or low areas: If not applying screed material, the contractor shall remove large clods, hard lumps, stones, roots, grass, weeds, debris (larger than 2” in diameter), stumps, litter, and foreign material while spreading. The contractor maintain levels, profiles, and contours of sub-grade. The Contractor shall manually spread topsoil around trees, plants, buildings and new work to prevent damage.

3. Lightly compact topsoil: The Contractor shall remove stones and other debris with a diameter over one inch shall be removed from the surface of the topsoil. A raked, uniform fine grade shall be established so that no depressions or high spots greater than ½” are present and water drains to structures, ditches, swales and paved surfaces as intended on the site plan and to provide a smooth mowing surface. Topsoil shall be hand-raked around trees, plants, buildings and new work to prevent damage. The
topsoiled area shall be ready to receive seed, sod, or plants without further soil preparation when the topsoiling operation is complete. If lawn is to be established by sodding, an allowance for sod thickness shall be allowed adjacent to sidewalks, curbs and any other fixed final elevations.

4. **Acceptance of fine grading:** The Owner, or his designee will inspect all fine grading work for acceptance upon written request by the Contractor. Written notice requesting such inspection shall be submitted by the Contractor at least ten days prior to the anticipated date of inspection. Fine grading shall be accepted by the Owner or his designee before the Contractor begins seeding or sod operations. Topsoiled area shall be seeded within 7 calendar days after application of topsoil is completed.

SECTION 603 - SEEDING

603.03 - Procedures – *is amended as follow*

(a) **Preparing Soil** – *is amended as follow*

- Clods, loose stones, and other foreign material larger than 3” in any dimensions – *replace with the following paragraph*

- Clods, loose stones, and other foreign material larger than 2” in any dimensions shall be removed and disposed of in accordance with Section 106.04 or directed by the Owner.

(b) **Applying Lime** – *add the following*

Lime shall be composed of finely ground calcitic or dolomitic limestone (calcium carbonate or calcium carbonate + magnesium carbonate), and contain a minimum of 50% total oxide equivalent (calcium oxide + magnesium oxide); neither hydrated or burnt lime shall be used for turfgrass seeding. Limestone shall be uniform in composition, free flowing, and suitable for application with mechanized rotary spreaders, drop spreaders, hydraulic seeders, or other equipment capable of uniformly distributing limestone over the soil surface.

Lime shall be composed of finely ground calcitic or dolomitic limestone (calcium carbonate or calcium carbonate + magnesium carbonate), and contain a minimum of 50% total oxide equivalent (calcium oxide + magnesium oxide); neither hydrated or burnt lime shall be used for turfgrass seeding. Limestone shall be uniform in composition, free flowing, and suitable for application with mechanized rotary spreaders, drop spreaders, hydraulic seeders, or other equipment capable of uniformly distributing limestone over the soil surface.

(c) **Applying Fertilizer** - *add the following*
Applying Fertilizer:

Starter fertilizer for seeding and sodding shall be a granular, non-burning turfgrass fertilizer with an N:P₂O₅:K₂O analysis ratio of 1:2:1, or equivalent and may only be used if the soil test shows to be below the very high scale, and only to the amount required, not to exceed 1 pound of phosphorus in a 30 day increment. Fertilizer shall be uniform in composition, free-flowing, and suitable for application with approved equipment. Fertilizer shall be delivered to the site in original, unopened containers, each bearing the manufacturer's guaranteed analysis label. At least 25% of available nitrogen shall be in a slow-release form if using a 0.5 pounds per 1000 ft² in 15 day intervals or if a 50% or more slow release nitrogen is used a 1 pound per 1000 ft² nitrogen fertilizer can be used in increments of 30 days not to exceed 4 pounds per year.

Maintenance fertilizer for all applications other than the initial fertilization shall be a granular, non-burning turfgrass fertilizer with an N:P₂O₅:K₂O analysis ratio of 3:0:2 or 4:0:2, or equivalent. P₂O₅ shall only be applied as indicated by soil test results. All fertilizer used and time intervals may refer to paragraph ‘Starter Fertilizer’, above. Fertilizer shall be uniform in composition, free flowing, and suitable for application with mechanized rotary spreaders, drop spreaders, hydraulic seeders, or other equipment capable of uniformly distributing fertilizer over the soil surface. Fertilizer shall be delivered to the site in original, unopened containers, each bearing the manufacturer's guaranteed analysis label. At least 25% of available nitrogen shall be in a slow-release form.
(d) **Applying Seed** - *add the following table:*

<table>
<thead>
<tr>
<th>Time of Year</th>
<th>Grass Seed #1</th>
<th>Grass Seed #2</th>
<th>Grass Seed #3</th>
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<tbody>
<tr>
<td><strong>Permanent Seeding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May 1 to July 30</td>
<td>Hybrid Turf-Type Tall Fescue* at a rate of 5-7 lbs. per 1000 sq. ft. (220-310 lbs./acre)</td>
<td>Hulled Common Bermuda grass seed at a rate of 1-2 lbs. per 1000 sq. ft. (45-90 lbs./acre)</td>
<td>None</td>
</tr>
<tr>
<td>August 1 to November 15</td>
<td>Hybrid Turf-Type Tall Fescue* at a rate of 5-7 lbs. per 1000 sq. ft. (220-310 lbs./acre)</td>
<td>Un-hulled Common Bermuda grass seed at a rate of 3-5 lbs. per 1000 sq. ft. (130-220 lbs./acre)</td>
<td>None</td>
</tr>
<tr>
<td>November 16 to April 30</td>
<td>Hybrid Turf-Type Tall Fescue* at a rate of 5-7 lbs. per 1000 sq. ft. (220-310 lbs./acre)</td>
<td>Un-hulled Common Bermuda grass seed at a rate of 3-5 lbs. per 1000 sq. ft. (130-220 lbs./acre)</td>
<td>Perennial Ryegrass* at a rate of 7-9 lbs. per 1000 sq. ft. (300-400 lbs./acre)</td>
</tr>
<tr>
<td><strong>Temporary Seeding</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Year</td>
<td>Annual Ryegrass at a rate of 7-9 lbs. per 1000 sq. ft. (300-400 lbs./acre)</td>
<td>Lime and/or fertilizer are not required with temporary seeding, however seeding shall be repeated until adequate cover of grass is achieved.</td>
<td></td>
</tr>
</tbody>
</table>

*Acceptable Hybrid Fescue Seed: Rebel, Titan, Jaguar, or Landscape Services approved equal.
+ Acceptable Perennial Ryegrass Seed: Champion, Calypso, or Landscape Services approved equal.

(g) **Repair of Deficient Lawn Areas** - *add the following paragraph*

**Repair of Deficient Lawn Areas:** Any deficiency in lawn establishment, as determined by the Owner, or his designee, shall be corrected by the Contractor within ten (10) working days, weather conditions permitting at no additional cost to the Owner. All corrected grading and lawn areas shall be in compliance with the original plans and specifications.
SECTION 604 - SODDING

604.03 - Procedures - is amended as follows

(a) Preparing Sod Beds - replaces with the following paragraphs

Preparing Sod Beds: Soil on which sod is to be placed shall be shaped to an even surface and graded to such an elevation that sod and adjacent surfaces will have a smooth contour.

Lime shall be composed of finely ground calcitic or dolomitic limestone (calcium carbonate or calcium carbonate + magnesium carbonate), and contain a minimum of 50% total oxide equivalent (calcium oxide + magnesium oxide); neither hydrated or burnt lime shall be used for turfgrass seeding. Limestone shall be uniform in composition, free flowing, and suitable for application with mechanized rotary spreaders, drop spreaders, hydraulic seeders, or other equipment capable of uniformly distributing limestone over the soil surface.

Starter fertilizer for seeding and sodding shall be a granular, non-burning turfgrass fertilizer with an N:P₂O₅:K₂O analysis ratio of 1:2:1, or equivalent and may only be used if the soil test shows to be below the very high scale, and only to the amount required, not to exceed 1 pound of phosphorus in a 30 day increment. Fertilizer shall be uniform in composition, free-flowing, and suitable for application with approved equipment. Fertilizer shall be delivered to the site in original, unopened containers, each bearing the manufacturer's guaranteed analysis label. At least 25% of available nitrogen shall be in a slow-release form if using a 0.5 pounds per 1000 ft² in 15 day intervals or if a 50% or more slow release nitrogen is used a 1 pound per 1000 ft² nitrogen fertilizer can be used in increments of 30 days not to exceed 4 pounds per year.

Maintenance fertilizer for applications other than the initial fertilization shall be a granular, non-burning turfgrass fertilizer with an N:P₂O₅:K₂O analysis ratio of 3:0:2 or 4:0:2, or equivalent. P₂O₅ shall only be applied as indicated by soil test results. All fertilizer used and time intervals may refer to paragraph ‘Starter Fertilizer’, above. Fertilizer shall be uniform in composition, free flowing, and suitable for application with mechanized rotary spreaders, drop spreaders, hydraulic seeders, or other equipment capable of uniformly distributing fertilizer over the soil surface. Fertilizer shall be delivered to the site in original, unopened containers, each bearing the manufacturer's guaranteed analysis label. At least 25% of available nitrogen shall be in a slow-release form.

In the absence of a site-specific soil test which indicates otherwise, apply starter fertilizer at a rate which provides 1 lb. of total nitrogen per 1000 sq. ft. based on fertilizer analysis. Submit fertilizer analysis for each type of fertilizer to be used for lawn establishment. Fertilizer applications shall be made with appropriately calibrated equipment in one or more separate operations. Following application of
lime and fertilizer, the soil shall be thoroughly cultivated to a depth of 2” to 3” and sprinkled with sufficient water to moisten the cultivated soil.

Water shall be free from oil, acid, alkali, salt, and other substances harmful to plant growth. The Contractor shall make, at his expense, whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs of this Contract. The contractor shall also furnish all necessary hose equipment, attachments and accessories for the adequate irrigation of planted areas as may be required to complete the work as specified.

Any certificates of inspection shall accompany the invoice for each shipment of sod when required by law for transportation. Provide copies of certificates of inspection with the Owner prior to the acceptance of the material. Inspection by federal or state authorities at place of growth does not preclude rejection of the sod at the site.

The Contractor shall provide the Owner with copies of any inspection certificates relating to the transportation of sod delivered to the site.

(b) **Placing Sod** – replace the fifth paragraph with the following

The Contractor shall thoroughly water and roll or tamp sodded areas after installation to press the root system of the sod into full contact with the underlying prepared soil bed.

(b) **Placing Sod** - add the following paragraph

Any deficiency in lawn establishment, as determined by the Owner, or his designee, shall be corrected by the Contractor within ten (10) working days, weather conditions permitting at no additional cost to the Owner. All corrected grading and lawn areas shall be in compliance with the original plans and specifications.

**SECTION 605 - PLANTING**

605.03 – Qualifications of Personnel – is amended as follow

(d) **Pruning** – replace with the following

(d) **Pruning** shall be performed under the direction of personnel certified by the International Society of Arboriculture.

605.04 - Procedures – is amended as follow

(d) **Planting:** – replace the “Plant Season Schedule” with the following paragraph
All plant material, including deciduous, evergreen, perennials, ornamental grasses and bulbs shall be planted from September 1 through May 15.

(p) **Pruning:** is amended as follows

1. **Limbs:** replace the fourth, fifth and sixth sentences with the following

   Pruning of trees and shrubs shall consist of removing dead, broken, or other branches and removing sprouts and sucker growth deemed injurious to the health of the plant. Care shall be taken to preserve the natural character of the plant. Pruning shall be performed with properly cleaned tools and equipment in excellent working and sharpened condition that are specifically designed for the appropriate work.

(q) **Planting**

5. **Preparing Plant Beds**
   
   b. replace the second sentence with the following

   Rocks over 2” in diameter, clods, roots and other objectionable material remaining on the surface shall be removed and disposed of in accordance with Section 106.04 or as approved in writing by the Owner.

6. **Installing Trees and Shrubs** replace the first sentence in first paragraph with the following

   Balled and bur lapped and containerized plant materials shall be installed in plant pits in accordance with the details and requirements of the City of Virginia Beach planting standard details

9. **Mulch** replace the second sentence with the following

   The Contractor shall apply mulch at the terminus of the Establishment Period at a depth of 3”.

10. **Staking, Guying, Anchoring:** replace the fourth, fifth and sixth sentences with the following

   The Contractor shall stake deciduous trees 1 ¾” to 2” in caliper and greater and evergreen trees 8” or taller, with three stakes. When two or three stakes are used, install two stakes parallel to traffic. Drive stakes vertically to a depth of 10” minimum below the bottom of the tree pit and into the undisturbed ground outside of the tree pit as reference in the City of Virginia Beach Planting Standard Detail.
605.04 - Procedures - add the following paragraph

(t) Wetlands Mitigation:

1. Quality control: The installer shall have a minimum of three years of experience in wetland mitigation planting.

2. Planting season: Planting season will extend from March 15 to June 30. If the construction schedule does not accommodate planting during this period, planting will be as directed by the Owner.

605.05 – Completion of Installation Phase – is amended as follows

(a) Installation Phase Plant Replacements: - replace “Engineer” with Landscape Architect
DIVISION VII

TRAFFIC CONTROL DEVICES
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SECTION 700 - GENERAL

700.02 - Materials – *is amended as follow*

(c) **Dissimilar metals** - *replaces with the following paragraph*

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

(j) **Breakaway support systems** - *replaces with the following paragraph*

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

Breakaway couplers will not be permitted.

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

1. **Frangible bases** shall be aluminum.

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

700.03 – **General Requirements** – *replace with the following paragraphs*

Cable wiring holes in traffic control device and ITS device structures shall be deburred and rounded, or fitted with a grommet. Damaged galvanization shall be repaired in accordance with Section 233. The size of the hole shall not exceed the sum of the diameter of the cables plus ½”.

The design of traffic control device and ITS device structures and foundations shall conform to AASHTO’s Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, 6th Edition (LTS-6), 2013 with 2015 interims, as modified elsewhere in the Contract.

700.03 – **General Requirements** – *add the following*

Poles, posts, and overhead and bridge-mounted sign structures shall conform to the following: When painting is not required, steel poles and posts shall be hot dip galvanized after fabrication. When painting is required, steel poles and posts shall be given one shop coat of primer and two field coats of paint. Traffic signal strain poles, and mast arms and poles shall be hot-dip galvanized, unless otherwise specified on the plans.
Traffic signal mast arm poles and strain poles shall be designed for loading shown on the plans including future loading specified in the plan notes and details.

700.03 – General Requirements – is amended as follow

(a) Sign Structures: - replace the second paragraph

Sign posts shall be wood or steel

1. Wood: For ground mounted sign post, wood products may not be used unless the wood post is used for large sign panels (over 60” in width or length) and the wood post shall be 6” by 6” and shall be Southern Pine, No. 1 and shall be treated as specified in Section 236. Breakaway support systems shall be as specified in the VDOT Road and Bridge Standards.

2. Steel: For ground mounted sign post, Telescoping Steel Quick Punch Sign Post shall be required and used as follows:

All posts and anchors shall conform to the Standard Specifications for Hot Rolled Carbon Sheet Steel, structural quality ASTM designation A570-79.

All posts and anchors shall carry a minimum certificate 60,000 PSI yield strength. All posts and anchors shall be manufactured from raw steel formed and welded on the corner prior to receiving a triple coat protection of inline hot-dipped, galvanized zinc per AASHTO M-120 (0.8 oz. per square foot) followed by a chromate conversion coating and a cross-linked polyurethane acrylic exterior coating. The interior shall receive a double coat of field zinc base organic coating, tested in accordance with ASTM B-117.

All top post shall be capable of fracturing at the point of connection with a single anchor, when impacted, in such a manner that the piece inside of the anchor can be removed so as to allow the anchor to receive a new top post. All top posts must meet FHWA breakaway requirements.

The shape of all poles and anchors shall be square, straight and smooth tubing welded in one corner, with a tolerance that permits telescoping of the next larger or smaller ¼” increment post size.

Knockout/hole diameter shall be 7/16” plus or minus 1/64” on 1” centers, on four opposite sides for the entire length of the post. Knockouts/holes shall be on the centerline of each side in true alignment and opposite to each other.

All posts and anchors shall or as instructed by the Traffic Operations Bureau be installed per the Manufacturer’s guidelines using the hardware specified in Table VII-3.
All posts and anchors shall meet the section properties defined in Table VII-2.

Table VII-2 - Section Properties Telescoping Steel Sign Post and Anchors

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 2</td>
<td>12 / 0.105</td>
<td>2.444</td>
<td>2.654</td>
<td>0.590</td>
<td>0.372</td>
<td>0.372</td>
<td>0.794</td>
</tr>
<tr>
<td>2 ¼ x 2 ¼*</td>
<td>12 / 0.105</td>
<td>2.794</td>
<td>3.004</td>
<td>0.697</td>
<td>0.501</td>
<td>0.564</td>
<td>0.899</td>
</tr>
<tr>
<td>2 ½ x 2 ½</td>
<td>12 / 0.105</td>
<td>3.144</td>
<td>3.354</td>
<td>0.802</td>
<td>0.642</td>
<td>0.803</td>
<td>1.001</td>
</tr>
</tbody>
</table>

* 2¼ x 2¼ anchors shall be used unless otherwise specified in the contract.

Holes to be fully perforated 7/16” diameter on 1” centers for at least the top 2” of the anchor while being truly aligned in center of section.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1¼ x 1¼</td>
<td>14 / 0.083</td>
<td>1.710</td>
<td>1.882</td>
<td>0.392</td>
<td>0.230</td>
<td>0.201</td>
<td>0.716</td>
</tr>
<tr>
<td>2 x 2 *</td>
<td>14 / 0.083</td>
<td>1.993</td>
<td>2.164</td>
<td>0.474</td>
<td>0.474</td>
<td>0.296</td>
<td>0.790</td>
</tr>
<tr>
<td>2 ¼ x 2 ¼</td>
<td>14 / 0.083</td>
<td>2.275</td>
<td>2.446</td>
<td>0.558</td>
<td>0.558</td>
<td>0.469</td>
<td>0.917</td>
</tr>
</tbody>
</table>

* 2” x 2” top posts shall be used unless otherwise directed in the contract and approved in writing by the Traffic Engineer and/or Traffic Operations Engineer.

Holes to be die embossed knockouts on 1” centers for the entire length of the post and truly aligned in center of section.

TOLERANCES: Tolerances on outside sizes:
Nominal Outside Dimensions Outside Tolerance at all Sides Corners

<table>
<thead>
<tr>
<th></th>
<th>Plus or minus .006”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½” x 1 ½”</td>
<td></td>
</tr>
<tr>
<td>1¾” x 1 ¾”</td>
<td></td>
</tr>
<tr>
<td>2” x 2”</td>
<td>Plus or minus .008”</td>
</tr>
<tr>
<td>2 ¼” x 2 ¼”</td>
<td>Plus or minus .010”</td>
</tr>
</tbody>
</table>

Note: Measurements for outside dimensions shall be made at least 2” from end of tube.

WALL THICKNESS TOLERANCE: Permissible variation in wall thickness is plus 0.011”, minus 0.008”.
CONVEXITY AND CONCAVITY: Measured in the center of the flat side tolerance is plus or minus 0.01” applied to the specific size determined at the corner.

SQUARENESS OF SIDES AND TWIST:

<table>
<thead>
<tr>
<th>Nominal Outside Dimensions</th>
<th>Twist Permissible Squareness Tolerance</th>
<th>in 3’ Lengths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½” x 1 ½”</td>
<td>Plus or minus 0.009”</td>
<td>0.050”</td>
</tr>
<tr>
<td>1 ¾” x 1 ¾”</td>
<td>Plus or minus 0.010”</td>
<td>0.062”</td>
</tr>
<tr>
<td>2” x 2”</td>
<td>Plus or minus 0.012”</td>
<td>0.062”</td>
</tr>
<tr>
<td>2 ¼” x 2 ¼”</td>
<td>Plus or minus 0.014”</td>
<td>0.062”</td>
</tr>
<tr>
<td>2 ½” x 2 ½”</td>
<td>Plus or minus 0.015”</td>
<td>0.075”</td>
</tr>
</tbody>
</table>

Note: A sample shall be considered to fail if its side is not 90° to each other by the tolerance listed above.

STRAIGHTNESS TOLERANCE: Permissible variation in straightness is 1/16” in three feet.

CORNER RADII: Standard outside corner radius shall be 5/32” plus or minus 1/32”.

TABLE VII - 3
Required Hardware for Telescoping Steel Sign Posts and Anchors

The hardware listed below shall be used in conjunction with the telescoping steel sign posts and anchors. The hardware poles and anchors shall be installed in compliance with the Manufacturer’s installation guidelines to the FHWA breakaway standards. The applicable hardware is as follows:

<table>
<thead>
<tr>
<th>Small Corner Bolt</th>
<th>5/16” x 2.25”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flanged Washer/Nut</td>
<td>5/16”</td>
</tr>
<tr>
<td>Drive Rivets</td>
<td>3/8” x 0.60”</td>
</tr>
<tr>
<td>Cherry Mate Rivets</td>
<td>¼” x 2 ⅛”</td>
</tr>
<tr>
<td>Nylon Washer</td>
<td>⅜”</td>
</tr>
<tr>
<td>Pyramid Rain Cap</td>
<td>2” square</td>
</tr>
<tr>
<td>PVC Spacer</td>
<td>½” x 1 ⅝”</td>
</tr>
</tbody>
</table>

(c) Signal Poles and Mast Arms: replace with the following

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

1. **Mast Arm Signal Poles:** The mast arms shall not deflect below the horizontal plane or below the minimum vertical clearance after the Standard Drawing MP-3 maximum loads are applied. The rise shall not exceed 3 percent of the mast arm length after the loads identified on the plans are applied, unless otherwise directed by the Owner.

   The flange plate and pole shall have a 4” wiring hole centered in the pattern that is deburred and rounded or fitted with a grommet. Mast arms shall be secured to the pole with thru-bolt, nuts, and washer connections. The flange plate shall be continuously welded to gusset and side plates. Gusset and side plates shall be continuously welded to the pole and each other. The flange plate shall be parallel to the axis of the pole. Flange plates for mast arm poles with two arms shall be positioned 90° to each other. The flange plate shall be designed to receive a minimum of eight 1 ½” diameter bolts for attachment of the arm.

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

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

   Mast arm pole types shall be in accordance with the following table. The poles shall be designed to support the maximum design loading allowed for that pole type, in accordance with the following table and Standard Drawing MP-3. The arms shall be designed to support the maximum design loading allowed for that mast arm length depicted in Standard Drawing MP-3.
<table>
<thead>
<tr>
<th>Pole Type</th>
<th># of arms</th>
<th>Maximum Allowable Loading as per Standard Drawing MP-3</th>
<th>Luminaire arm?</th>
<th>Length of Pole (top of pole to bottom of base plate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>49 ft. Loading Standard</td>
<td>No</td>
<td>20</td>
</tr>
<tr>
<td>B1</td>
<td>1</td>
<td>75 ft. Case 1 Loading Standard</td>
<td>No</td>
<td>20</td>
</tr>
<tr>
<td>B2</td>
<td>1</td>
<td>75 ft. Case 2 Loading Standard</td>
<td>No</td>
<td>20</td>
</tr>
<tr>
<td>C</td>
<td>2 (mounted at 90° to each other)</td>
<td>70 ft. Loading Standard &amp; 60 ft. Loading Standard</td>
<td>No</td>
<td>20</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>49 ft. Loading Standard</td>
<td>Yes</td>
<td>30</td>
</tr>
<tr>
<td>E1</td>
<td>1</td>
<td>75 ft. Case 1 Loading Standard</td>
<td>Yes</td>
<td>30</td>
</tr>
<tr>
<td>E2</td>
<td>1</td>
<td>75 ft. Case 2 Loading Standard</td>
<td>Yes</td>
<td>30</td>
</tr>
<tr>
<td>F</td>
<td>2 (mounted at 90° to each other)</td>
<td>70 ft. Loading Standard &amp; 60 ft. Loading Standard</td>
<td>Yes</td>
<td>30</td>
</tr>
</tbody>
</table>

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

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

2. **Strain Signal Poles** shall be erected on foundations designed in accordance with Standard Drawing PF-8. Washers are required above and below the base plate. The structure and the foundation shall be designed for the loads shown on the plans. Strain signal poles shall be field drilled for the attachment of span wire and tether wire. Span wire shall be located at least 18” below the top of the pole. All loads shall be assumed to be tethered and no load reduction for breaking of the tether wire shall be used in the pole design.
Strain poles shall not exceed a dead load deflection of 3 percent of the distance between the base of pole and point of dead load attachment.

3. **Pedestal Signal Poles** shall be screwed into transformer base and include a bolted on collar.

4. **Luminaire arms** attached to signal poles shall be galvanized steel, and shall be as specified in Standard Drawing MP-3. Luminaire arms shall be truss-style arms. All luminaire arms shall be attached to the pole by means of a welded plate and bolts. U-bolts shall not be allowed on new poles.

Luminaire arms on joint use traffic signal poles shall have 2 ⅜” O.D. and 2” I.D. dimensions for a minimum length of 7” from the end of the arm for the attachment of the luminaire fixtures.

(d) **Camera Poles** for the support of ITS equipment shall be galvanized steel of a one-piece or sectional single unit, tubular form, and shall be round or multisided. Multisided poles shall have at least eight sides. They shall have at least four (4) anchor bolts.

700.04—**Working Drawings** – replace the last paragraph with the following

The Contractor’s engineer shall verify that the proposed traffic control device or ITS device foundations and structures are designed in accordance with the requirements of the Plans, Specifications, Standard Drawings, and the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals, 6th Edition (LTS-6), 2013 with 2015 interim, as modified elsewhere in the Contract; based on site conditions, required loadings, and required vertical clearances.

700.05 – **Procedures** – is amended as follows:

(c) **Concrete Foundations:** - replaces the fourth paragraph with the following:

Each foundation shall be permanently marked to indicate the locations of all conduits cast in the foundation. Each marking shall consist of an arrow, 4” to 6” long, and a letter designation as follows: (S) - spare conduit; (T) - conduit signal or detector cables; (E) - conduit with electrical service conductors for traffic signal; (L) - conduit for luminaire conductors on joint use poles; (G) - conduit with grounding conductor(s). The marking shall be etched with a trowel ¼” deep in the concrete while the concrete is being finished.

(c) **Concrete Foundations:** - replaces the seventh paragraph with the following

The foundation for signal poles, high mast lighting poles and overhead sign structures shall be constructed in accordance with the contract document.
(d) **Electrical Service:** *replaces the second and third paragraph with the following*

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

(d) **Electrical service:** *add the following paragraphs*

A circuit breaker box shall be provided as the disconnect means for traffic signals and lighting on overhead sign supports. When the plans detail the breaker box to be installed on a steel pole and connected to the pole with fittings and close nipples, the Contractor shall have the pole fabricated with blind half couplings for attachment of these items, or drill and weld blind half couplings to the pole following procedures approved by the pole manufacturer.

All underground service entrance conductor cables shall be placed in galvanized rigid steel conduit conforming to Section 238.

Unless otherwise specified on the plans, the Contractor shall furnish the Traffic Engineering Division with a 120 day advance written notification of the need for electrical service to each new or relocated traffic signal installation and temporary signals.

(e) **Poles, Posts, Sign Structures and ITS Support Structures:** *replaces the third sentence of the third paragraph with the following*

The tag shall be imprinted with "CITY OF VIRGINIA BEACH", the manufacturer's name and design/job number, location, and year of fabrication.

(e) **Poles, posts, sign structures, and ITS structures:** *replaces the fifth paragraph with the following*

All signal poles, light poles not mounted on transformer bases, camera poles, and overhead sign structures shall be provided with hand holes that are on the opposite side from traffic. The dimensions for hand holes shall be the following: Signal Poles 5” x 8”, Camera Poles 5” x 8”, Unfluted Light Poles 2 ½” x 5”, Fluted Light Poles 2” x 5”, and all other poles 3” x 5”, unless otherwise specified in the Standard Drawings. Hand holes shall be provided with a weatherproof gasket and cover. Hand holes shall be lockable, capable of being opened by approved latching
mechanism. If specified in the Contract Documents, a lockable hand hole cover shall be provided, using key requirements provided by the Owner.

For structures mounted on transformer bases, the transformer bases shall have hinged access covers on the side opposite traffic. The Contractor shall furnish the Owner with at least one tool or key required to open the hand holes and transformer base access covers for each 40 structures, or fraction thereof.

(e) **Poles, Posts, Sign Structures and ITS Support Structures:** *add the following paragraphs*

Traffic signal strain poles, mast arm poles, and pedestal poles shall be fabricated with a UL listed grounding lug welded to the pole shaft at the base of the pole. The lug shall be accessible from the hand hole and shall be sized for terminating one (1) No.6 AWG solid bare copper bonding conductors. One (1) grounding lug shall be furnished on joint use traffic signal/lighting poles.

Any poles which develop defects in the course of handling or erection, due to the materials or process of manufacture, may be rejected by the Owner.

(f) **Breakaway Support Systems:** *replaces with the following paragraph*

(f) **Breakaway Support Systems** Breakaway support systems shall be installed where specified on the plans and installed according to the manufacturer’s instructions. Breakaway support systems shall not be used for poles that support electrical power service equipment.

(g) **Conductor Cables:** *add the following in the twentieth paragraph; (regarding Megger test):*

All tests shall be conducted in the presence of the Owner or the owners designated representative.

(g) **Conductor Cables:** *is amended as follows:*

2. **Signal and interconnect cable color coding identification:** *replaces the color coding for signal cables with the following:*

<table>
<thead>
<tr>
<th>Pedestrian Signals</th>
<th>14/3 Cable</th>
<th>14/4 Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>Black</td>
<td>Green</td>
</tr>
<tr>
<td>Don’t Walk</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>AC-Ground</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td>Spare</td>
<td>----</td>
<td>Black</td>
</tr>
</tbody>
</table>
(g) **Conductor Cables:** – *add the following paragraph*

When new conductor cable is specified to be installed in conduit with existing cable, the Contractor shall first remove the existing cables and inspect them for damage. Damaged cable shall be replaced as directed by the Owner. The Contractor shall then install the new and existing cables in the conduit as a single unit.

(h) **Conduit Systems:** - *replace the fifth paragraph with the following*

After testing, all individual conduit runs which are to remain empty shall be equipped with a pull rope and a locating wire. The pull rope shall be of nylon or

<table>
<thead>
<tr>
<th>3 Section Vehicle Signals</th>
<th>14/4 Cable</th>
<th>14/5 Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green (Ball or Arrow)</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Amber (Ball or Arrow)</td>
<td>Black</td>
<td>Orange</td>
</tr>
<tr>
<td>Red (Ball or Arrow)</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>AC-Ground</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td>Spare</td>
<td>----</td>
<td>Black</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 Section Vehicle Signals</th>
<th>14/7 Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Ball</td>
<td>Green</td>
</tr>
<tr>
<td>Amber Ball</td>
<td>Orange</td>
</tr>
<tr>
<td>Red Ball</td>
<td>Red</td>
</tr>
<tr>
<td>Green Arrow</td>
<td>Blue</td>
</tr>
<tr>
<td>Yellow Arrow</td>
<td>Black</td>
</tr>
<tr>
<td>AC-Ground</td>
<td>White</td>
</tr>
<tr>
<td>Spare</td>
<td>White w/black tracer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4 Section Vehicle Signals</th>
<th>14/5 Cable</th>
<th>14/7 Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Ball</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Amber Ball</td>
<td>Orange</td>
<td>Orange</td>
</tr>
<tr>
<td>Red Ball</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td>Green Arrow</td>
<td>Green</td>
<td>White w/black tracer</td>
</tr>
<tr>
<td>AC-Ground</td>
<td>White</td>
<td>White</td>
</tr>
<tr>
<td>Spare</td>
<td>----</td>
<td>Black</td>
</tr>
<tr>
<td>Spare</td>
<td>----</td>
<td>Blue</td>
</tr>
</tbody>
</table>
polypropylene having a tensile strength of at least 1000 pounds and with 12” of the rope doubled back into the conduit at each end. The locating wire shall be No. 10 stainless steel.

(h) **Conduit Systems: – is amended as follow**

2. **Buried conduit systems - replaces the second paragraph with the following**

When Schedule 40 PVC is to be installed under roadway pavement and driveway entrances, it shall be placed in a rigid steel pipe sleeve. The pipe sleeve shall be either jacked or bored in accordance with the requirements of Section 302; or if open cutting is permitted, installed in accordance with VDOT’s Standard Detail (ECI-1) “Electrical Conduit and Conductor Cable Underground Installation”. HDPE Schedule 80 or greater conduit shall be permitted to be directionally drilled under roadways or driveways.

**700.06 - Measurement and Payment – is amended as follow**

**Concrete foundations – replaces the following paragraph**

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

**Luminaire arms – replaces the following paragraph**

Luminaire arms will not be measured for separate payment and will be paid for as part of the contract price for signal poles and/or lighting poles. Luminaire arm shall include providing design and shop drawings, luminaire arm, pole mounting brackets, rubber grommets, field drilling, galvanization repairs if required, fittings and mounting hardware.

**Lighting poles – replaces the following paragraph**

Lighting poles will be measured in units of each and will be paid for at the contract unit price per each for the standard and luminaire mounting height or type specified. This price shall include providing design and shop drawings; pole shafts, grounding lugs, hand holes, locks (when
required), caps, identification tags, base plates, vibration dampeners (when required), bracket arms, breakaway support systems, field drilling, and galvanization.

**Signal poles** – replaces the following paragraph

**Signal poles and mast arms (Furnish and Install)** will be measured in units of each and will be paid for at the contract unit price per each for the standard, class and type specified. This price shall include furnishing and installing the pole shafts, mast arms, luminaire arms, J-hooks, grounding lugs, hand holes and covers, identification tags, pole and arm caps, fittings, anchor bolts, bolts covers, field drilling, show drawings, rubber gaskets or grommets, field adjustments of arm lengths and signal pole heights, galvanization, painting when required, and restoring area.

**Signal poles and mast arms (Install Only)** will be measured in units of each and will be paid for at the contract unit price per each. This price shall include picking up the Owner furnished pole shafts, mast arms, luminaire arms, J-hooks, grounding lugs, hand holes and covers, identification tags, pole and arm caps, fittings, anchor bolt nut covers, show drawings, rubber gaskets or grommets, field adjustments of arm lengths and signal pole heights at the location specified on the plans. The Contractor shall provide installation, field drilling, restoring area, galvanization and painting when required in the field.

**Mast arms** – replaces the following paragraph

**Mast arms** will not be measured for separate payment and will be paid for as part of the contract price for signal poles. Mast arm shall include providing design and shop drawings, mast arm caps, J-hooks, grounding lugs, locking hand holes, caps, fittings, anchor bases, identification tags, field drilling and galvanization.

**Overhead sign structures** – replaces with the following paragraph

**Overhead and bridge mounted sign structures** will be measured in units of each and will be paid for at the contract unit price per each for the location specified. The price shall include furnishing design and shop drawings, structural units and supports, field drilling and adjustment, galvanization, base plates, hand holes, locks (when required), caps, grounding equipment and lugs, electrical systems including conduit, sign luminaires, luminaire supports, fittings, anchor bolts, conductor cable, painting when required, identification tags and restoring existing areas.

**Sign posts** – replaces with the following paragraph

**Sign posts** will not be measured for separate payment and will be paid for as part of the contract price for sign panels under Section 701.04. Sign posts shall include clamps, identification tags, and breakaway base assemblies. Square tube post foundation is incidental and shall be included in the cost of the sign panel.

**Pedestal poles** – replaces with the following paragraph
Pedestal poles will be measured in units of each and will be paid for at the contract unit price per each for the standard and length specified. This price shall include caps, breakaway support systems, hand holes, hinged access covers, galvanization, grounding lugs, identification tags, anchor bases, bolt covers and restoring area.

Conduit – replaces with the following paragraph

Conduit will be measured in linear feet and will be paid for at the contract unit price per linear foot for the type and size specified. This price shall include conduit bodies, fittings, conduit straps and clamps on poles, entrance heads, bonding systems, pull ropes, pull tapes and No 10 locating wires, plastic spacers, pull or splice boxes with an area of 512 cubic inches or less, supports, protective metal shields, trenching, pavement open cutting, installing conduit in jacked or bored pipe sleeve, backfilling, pavement patching, locator tape, compacting, disposing of surplus and unsuitable material, encasing, and restoring existing areas.

Trench Excavation – replaces with the following paragraph

Trench Excavation will not be measured for separate payment. The cost for this work shall be included in the unit bid price for Conduit and Electrical Service items.

Junction boxes – replaces with the following paragraph

Junction boxes will be measured in units of each and will be paid for at the contract unit price per each for the standard indicated. This price shall include 12” concrete collars, frames and covers, tools to remove the cover, grounding electrode (including grounding electrode clamps and grounding electrode conductors), grounding lugs, knockouts, cable racks, bracing, and aggregate, excavating, backfilling, compacting, disposing of surplus and unsuitable material, and restoring disturbed areas.

700.06 - Measurement and Payment – add the following pay items

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

700.06 - Measurement and Payment - add or replace the following pay items
Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete foundation (Standard, type)</td>
<td>Cubic yard, Each</td>
</tr>
<tr>
<td>Lighting pole (Standard, luminaire mounting height, or type and luminaire arm length(s))</td>
<td>Each</td>
</tr>
<tr>
<td>Signal pole and mast arm (Furnish and install) (Standard, length, loading case of mast arms, and luminaire arms)</td>
<td>Each</td>
</tr>
<tr>
<td>Signal pole and mast arm (Install only) (Standard, length, number and length of mast arms, and luminaire arms)</td>
<td>Each</td>
</tr>
<tr>
<td>Steel strain pole (Standard and length)</td>
<td>Each</td>
</tr>
</tbody>
</table>

700.07 - **Submittals and Certification** - *add the following paragraphs*

700.07 - **Submittals and Certification**

The Contractor shall submit the following Shop Drawings for approval:

- **(a)** Electrical and signal junction boxes, frames and covers
- **(b)** Conduit, couplings and fittings, conduit bodies, weatherheads, conduit clamps and straps and locator tape
- **(c)** Conductor cables, including signal cable, loop detector lead-in cable, electrical service conductors, push button conductor cable, interconnect cable and connectors for terminating conductors
- **(d)** Poles, including steel strain poles, mast arm poles, wood poles, pedestal poles and anchor bolts for these items
- **(e)** Electrical service and grounding system materials and equipment including safety switches and breaker boxes, ground rods, ground wires and ground clamps
- **(f)** Sign posts, clamps and sign fasteners
- **(g)** Bridge mounted sign structures
- **(h)** Overhead sign structures
- **(i)** Lighting poles and luminaire arms
- **(j)** Concrete for pole and cabinet foundations, sign structure foundations and junction box collars
- **(k)** Junction boxes
- **(l)** Reinforcing steel for signal pole and sign structure foundations.

Certification: The Contractor, with his associated materials suppliers, shall provide certifications acceptable to the Owner that all materials supplied on the project meet or exceed the requirements of the plans and specifications.
SECTION 701 - TRAFFIC SIGNS

701.03 - Procedures

(a) **Fabrication**: is amended as follow

2. **Sign panels** - replaces with the following paragraph

Sign panels: For permanent signing, sign panels fabricated under 48” in width or length shall be fabricated with aluminum 0.080” in thickness.

For permanent signing, sign panels fabricated 48” or more in width or length shall be fabricated with aluminum 0.125” in thickness.

Sign panels shall be fabricated of plate aluminum alloy and shall be smooth, flat, and free of metal burrs and splinters.

Sign panels for overlay shall be aluminum alloy conforming to the Section 229.02(a), between 0.080 and 0.100 gage in thickness.

Extruded sign panels shall conform to the Standard Drawing and Section 229.02(c).

The corners on all signs shall be rounded in accordance with the U.S. Department of Transportation’s manual for ”Standard Highway Signs” as referenced in the MUTCD.

A neoprene gasket 1/16” in thickness shall be used between the sign face and the sign fastener bolt.

a. **Street name blades**: - Dimensions shall be one of the following: 30”, 36”, 42”, or 48” horizontal by 9” vertical for ground mount installations; 12” minimum vertical for mounting on signal poles; 60”, 72”, 84” or 96” horizontal by 18” vertical for installation on traffic signal pole mast arms.

Street name prefix lettering will be Highway Gothic C or D series. Lettering size will depend on sign height.

Street name suffix lettering will consist of Highway Gothic C or D series. All suffixes will be abbreviated and placed in line with the top of the prefix at the upper right-hand corner of the street name sign. Lettering size will depend on sign height.

Block numbers are required for all overhead street names blades. Block numbers will consist of Highway Gothic C or D series. Block
numbers will be fabricated to the nearest hundred block and will be placed in line with the bottom of the prefix at the lower right-hand corner of the street name sign. Lettering size will depend on sign height.

b. **Nine-Inch Street Name Blade:** Street name blades will consist of two flat aluminum blades, 0.080” thickness and shall be installed using approved spacers and mounting hardware and the following:

Street name shall consist of upper case and lower case lettering. Upper case lettering shall be 6” in height. Lower case lettering shall be 4” in height.

Street name suffix lettering shall be 2 ½” in height. All suffixes will be abbreviated and placed in line with the top of the prefix at the upper right hand corner of the street name sign.

c. **Twelve-Inch Flat Aluminum Blade:** Street name shall consist of upper case and lower case lettering. Upper case lettering shall be 8” lettering in height. Lower case lettering shall be 6” in height.

The suffix/block number lettering shall be 3 ½” in height with 1” separation between suffix and block number. All suffixes will be abbreviated and placed in line with the top of the prefix at the upper right hand corner of the street name sign. All block numbers will be fabricated to the nearest hundred block. All block numbers will be placed in line with the bottom of the prefix at the lower right hand corner of the street name sign.

d. **Eighteen-Inch Flat Aluminum Blade:** Street name shall consist of upper case and lower case lettering. Upper case lettering shall be 10” lettering in height. Lower case lettering shall be 7 ½” in height. There shall be a 1” border around the entire sign of the same material as the lettering.

The suffix/block numbers lettering shall be 4 ½” in height with 1” separation between suffix and block number. All suffixes will be abbreviated and placed in line with the top of the prefix at the upper right hand corner of the street name sign. All block numbers will be fabricated to the nearest hundred block. All block numbers will be placed in line with the bottom of the prefix at the lower right hand corner of the street name sign.

(a) **Fabrication:** *add the following paragraph*
10. **Structural steel items:** Fabrication, welding and inspection of structural steel items shall conform to the requirements of Section 407.

701.04 - **Measurement and Payment** - *replaces with the following pay item for payment*

Sign Panels will be measured in square feet and will be paid for at the contract unit price per square foot. This price shall include background sheeting, sign messages, sign fabrication, finishing, framing units, hardware, bracing, stiffeners, splicing, backing strips, post clips/post clamps, warranty, labeling, telescoping quick punch sign posts and anchors, sign hanger assemblies for span wire or mast arm mounted overhead signs, and all incidentals necessary to complete the work.

701.04 - **Measurement and Payment** - *add the following pay items for payment*

Overhead Mounted Sign Panel Installation will be measured in units of each and will be paid for at the contract unit price per each. This pay item shall be used only at location shown in the bid documents. This price shall include pick up of the Owner furnished signs from 3556 Dam Neck Road, installation of the signs as specified on the plans, and all other incidentals necessary to complete the work. The contractor shall provide all approved mounted hardware or sign hanger hardware necessary to complete the sign installation.

701.04 - **Measurement and Payment** - *add the following pay items*

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Overhead Mounted Sign Panel Installation</td>
<td>Each</td>
</tr>
</tbody>
</table>

701.05 - **Submittals and Certification** - *add the following:*

701.05 - **Submittals and Certification**

Submit Shop Drawings of the following for approval:

(a) Sheeting materials
(b) Sign panel materials
(c) Sign layout for street name signs and all non-standard MUTCD signs
(d) Sign posts
(e) Sign hanger assemblies, brackets, fasteners

Certification: The Contractor, with his associated materials suppliers, shall provide certifications acceptable to the Owner that all materials supplied on the project meet or exceed the requirements of the plans and specifications.

**SECTION 703 - TRAFFIC SIGNALS**

703.02 - **Equipment** - *is amended as follows*

(a) **Traffic Signal Controllers** – *add the following to the second paragraph*
• Controller shall include Ethernet capable NEMA TS-2 Type 1.

(d) **Signal heads** - replaces second paragraph with the following

Cast aluminum signal heads shall be used for all installations. Polycarbonate signal heads shall not be used.

(d) **Signal heads** - replaces third paragraph with the following

Signal head housings shall be Black unless otherwise specified in the Contract. The inside of visors shall be flat black.

(d) **Signal heads** - replaces sixth paragraph with the following

Standard traffic signal head sections shall conform to the requirements of the ITE Standard for Vehicle Traffic Control Signal Heads and Section 238, and shall include tunnel visors

(d) **Signal heads** – add the following paragraph

Traffic signal lamp wattages shall conform to the requirements of ITE Vehicle Traffic Control Signal Heads-Light Emitting Diode Circular Signal Supplement issued on June 27, 2005 (inclusive of any ITE documents that amend, revise, and/or supersede it) and section 238.

(f) **Detectors:** is amended as follows

4. **Emergency vehicle preemption (EVP) detection system** – replaces first paragraph with the following

**Emergency vehicle preemption (EVP) detection system** shall be optically activated providing all features and functions as the existing equipment within the City of Virginia Beach's emergency preemption system and shall fully interface with that existing equipment. Existing equipment consists of GTT Opticom Infrared Model 711 Single Channel - One Direction Detectors, Model 721 Single Channel – Two Direction Detectors, Model 722 Two Channel – Two Direction Detectors, Opticom Model 764 Multimode Phase Selector, Opticom Model 768 Auxiliary Interface Panel, Opticom Model 138 Detector Cable, and appropriate detector panels to interface preemption devices to the Owner’s controllers. Equipment shall be classified as Type I (1 Approach Detection), Type II (2 Approach Detection), Type III (3 Approach Detection), and Type IV (4 Approach Detection). Conductor cables between the optical detectors and the phase selectors/system chassis shall be in accordance with the manufacturer's recommendations.
5. **Pedestrian push buttons - add the following paragraphs**

The Contractor shall include a 9” x 12” pedestrian push button sign. Pedestrian signs shall include the appropriate message and shall conform to Section 2B-44 of the MUTCD.

Push button must be highly vandal resistant and pressure activated with essentially no moving parts. Push button must be able to withstand an impact from a baseball bat or hammer. Push button must have raised ridges to protect the button from side impacts.

Push button housing must be cast aluminum powder coated. Push button cap must be made of 316 stainless steel.

Switch must be solid state electronic Piezo switch rated for 100 million cycles with no moving plunger or moving electrical contacts.

Push button must be LED to give indication of push button being pushed per the MUTCD, Section 4E.08. Push button must give a two toned beep indication of push button being pushed (one tone for push, one tone for release). Push button must have built-in surge protection.

Push button must be able to hold the call for a minimum of 5 seconds. Push button must operate immediately after being immersed in water for 5 minutes. Push button must not be able to allow ice to form such that it would impede the function of the push button or push button cap.

All switch electronics must be sealed within the cast aluminum housing. Total depth of push button, from face of button cap to back of button terminal, must be less than 1 ¾”.

Push buttons shall have a two year warranty.

703.02 - **Equipment - add the following paragraphs**

(g) **School zone caution light assembly** shall consist of furnishing and installing mast arm mounted school zone caution light assemblies. Each assembly shall include cabinet with a programmable solid state time switch, wiring from the cabinet to the warning beacons, twelve 12” LED incandescent look signal head warning beacons, indicator beacon and wiring, school speed limit sign panel, mounting hardware and all incidental fittings necessary for the operation of the unit during the prescribed time periods.

1. **Warning beacons** shall be 12” cast aluminum traffic signal head sections with amber section conforming to Section 238. Each section shall include an incandescent look LED traffic signal module. The section shall be mounted
to the sign in such a manner as to allow maintenance personnel to easily access the interior of each housing to replace the module and clean. Sign assembly shall comply with the MUTCD

2. **Cabinet and Interior Wiring:** The cabinet shall be fabricated of welded sheet aluminum 0.125” minimum, conforming to Section 229 and shall be fabricated, welded and inspected in accordance with the requirements of Section 407. All exterior seams shall be continuously welded. Cabinet mounting attachments shall be durable, corrosion resistant and of heavy-duty construction. The cabinet door shall provide full access to the cabinet interior and shall be gasketed to assure waterproofing. The cabinet door shall include a standard police lock with two (2) keys provided with each cabinet. The cabinet door hinge and hinge pin shall be stainless steel. The nominal outside dimensions of the cabinet shall be 14” H x 14” W x 7” D. The cabinet shall have a natural aluminum finish. All conduit bodies or other cable entry fittings shall be attached to the bottom of the cabinet. Entry through the sides, back, or top will not be permitted.

The cabinet shall be furnished with the components specified below and wired in accordance with latest applicable Sections of the NEMA TS-1 Publication and its revisions. Flashers for operating flashing beacons furnished by the Contractor shall be certified by the manufacturer as conforming to the requirements of NEMA TS-1 and any exceptions or additions stated herein unless otherwise specified. The manufacturer shall also provide certification from an independent testing laboratory that the model flasher furnished conforms to NEMA environmental standards and test procedures. Flashers shall be the manufacturer's standard design. Flashers shall operate from a 120-volt, 60Hz, single-phase, AC power supply. The manufacturer's name, model number, serial number and part identification number shall be permanently attached to the cover of the flasher. The Contractor shall furnish the manufacturer's instructions for installing and maintaining the flasher.

All components shall be mounted on a removable metal back panel (13-gage minimum). The removable panel shall be fastened to the cabinet with a minimum of four (4) standoffs mounted on the backwall of the cabinet.

Cabinet shall include a plug-in dual circuit NEMA flasher and base. The flasher shall be solid state construction and shall have a 15-amp rating over a temperature range of -34° C to +74° C, with an LED indicator for each circuit. The flasher circuit shall include a power transfer relay. The coil side of the relay shall be wired to the output of the time switch. The contacts of the relay shall apply power to the NEMA flasher. The power relay shall have contacts rated at 30 amps.
The cabinet shall include lightning and surge protection. The lightning and surge protection shall consist of a medium duty AC service arrester to protect the time switch and associated equipment from voltage surges. The arrester shall be installed using studs and shall be easily replaceable from the front of the cabinet assembly with the use of simple hand tools. The arrester shall conform to the following:

- Repetitive Peak Surge Current: 15000 amps
- Peak Surge Voltage (at 10 kA): 680 volts
- Energy Handling: 220 joules
- Power Dissipation Rate: 15 watts max.
- Continuous AC Voltage: 50 VAC RMS
- Peak Voltage (1 ma): 212 volts
- Typical Capacitance: 4000 picofarads
- Operation Temperature: -40° C to +85° C

A fifteen (15) amp circuit breaker shall be furnished for the incoming AC+ line. A clear Plexiglas shield with an opening for the manual operation of the circuit breaker shall be installed over the panel with standoffs and thumbscrews.

Barrier type terminal blocks shall be installed to terminate all wire connections. The terminal blocks shall have a minimum of eight (8) positions to terminate the following functions:

- Normally open contact of the time clock relay
- Common contact of the time clock relay
- Normally closed contact of the time clock relay
- Neutral for load-1
- Neutral for load-2
- Load-1 from the flasher
- Load-2 from the flasher
- AC

All of the above functions shall be clearly marked on the panel adjacent to the terminal block by either etching or silk screening.

A copper connector capable of terminating wire sizes ranging from #6 to #14 AWG shall accommodate field wiring.

A ground fault convenience receptacle shall be mounted in a readily accessible location within the cabinet. It shall be wired to the load side of the 15 amp circuit breaker.

Radio frequency interference filter rated at 50 amps.
A listing indicating all terminal numbers with a description of its use shall be attached to the inside of the cabinet door and overlaid with a clear, plastic covering. All edges of the plastic shall extend one (1”) inch beyond the listing and be sealed with a clear weather-proofing compound. Two prints of the complete cabinet circuitry shall be furnished.

3. **Solid State Time Switch** shall provide all features and functions and be fully compatible and interchangeable with the City of Virginia Beach's current inventory of time switches which consists of RTC Manufacturing, Inc. Model AP42 time switches. Programming will be completed by the City of Virginia Beach. The Contractor shall notify Traffic Operations at 757-385-1470 once the installation is complete and ready to be programmed.

4. **Electrical Wiring:**

   Control equipment, warning beacons and indicator beacon shall operate from single-phase two wire 120 VAC power source.

   Wiring between the cabinet and the warning beacons shall be continuous and terminations made on terminal blocks. Splices will not be permitted.

   Wiring to the indicator beacon may be spliced. Such splicing shall be in accordance with the NEC and readily accessible for inspection and maintenance.

5. **Indicator Beacon** shall be installed on the mast arm on the side opposite the sign face. Indicator beacon shall be wired to one of the warning beacon circuits to give a flashing indication when the warning beacons are in operation. This indication shall be visible, under normal conditions, for a minimum distance of 500 feet within the school zone.

   The indicator beacon shall be furnished with a solid state lighting Edison screw based LED lamp.

(h) **Internally illuminated street name sign (IISNS):** This work shall consist of furnishing and installing LED back fit edge-lit internally illuminated street name signs on traffic signal poles and mast arms in accordance with this provision, the plans and as directed by the Owner.

   LED back lit edge-lit internally illuminated street name signs shall be internally illuminated and furnished with one sign message panel, designed as single faced. The illuminated LED sign shall include the sign housing, reflectors, sign panel(s), seals, LED’s, photoelectric control, conductors, terminal blocks and compartments, mounting assemblies, and painting when specified. The sign shall be a rigid mounted unit and attached to a steel traffic mast arm.
UPON REQUEST, THE VENDOR SHALL FURNISH AT NO COST TO THE
OWNER, ONE COMPLETE SAMPLE SIGN ASSEMBLY AND MOUNTING
ASSEMBLY FOR INSPECTION BY THE OWNER PRIOR TO AWARDING A
PURCHASE ORDER.

1. Mechanical Specifications:

The outer dimensions of the sign assembly (excluding the mounting bosses)
shall be standard widths of 15”, 18”, 20”, and 24”, and standard lengths of
48” – 96”, at 6” increments.

The maximum thickness of the sign shall be 1.38” for the single sided signs.

The long edges of the sign shall be made from a single section of 6063-T5
Aluminum extrusion. The ends caps shall be affixed to the frame with
stainless screws. The end caps shall be removable to enable replacing panels
and components.

The overall weight, excluding mounting hardware, shall not exceed 6
pounds per square foot for the single sided signs.

The sign shall have a polycarbonate panel that is UV, weather, abrasion and
impact resistant. The sign panels shall be replaceable.

2. Environmental Specifications:

The sign shall be designed in conformance with the latest requirements of
the AASHTO publication, “Standard Specifications for Structural Supports
of Highway Signs, Luminaries and Traffic Signals”.

The sign and power supply should be able to withstand and operate at
temperature extremes of -40° F to +140° F.

3. Luminance:

Minimum luminance of the sign legend shall be 250 nits (Candela / Square
Meter). Minimum luminance of the sign background shall be 25 nits
(Candela / Square Meter). Sign elements to be illuminated shall include the
sign legend and background, per MUTCD Section 2A.08.

4. Sign Sheeting:

Sign legend and background shall be retro reflective, per MUTCD Section
2A.08. Sign film shall be ultraviolet (UV) resistant.

5. Light Source:
The light source for the sign shall be LEDs (light emitting diodes) that are mounted along the top and bottom edges of the sign. The LEDs shall evenly illuminate a light panel that is the same dimensions of the sign face. The LEDs shall have a minimum projected life of 50,000 hours.

Each sign assembly consists of an electrical/electronic package consisting of a power supply, Light Engine, and fuse. All LEDs shall be mounted onto a circuit board which is mounted onto an aluminum heat sink.

The LED drive current shall be regulated using a pulse width modulated 24v DC drive and limited to a maximum of 300mA through the LED chain at normal room temperature. Light intensity shall remain stable under varying voltage conditions.

LEDs within the light engine shall be series wired for increased efficiency and incorporate fault tolerant design. An LED bypass shall isolate a failure to that particular LED and will allow the remaining LEDs to operate normally. The constant current regulator shall readjust the drive current to prevent overdriving the remaining operable LEDs in the chain.

Thermal monitoring shall provide temperature protection to the LED chain. As the heat sink temperature increases, the LED drive current shall be reduced along with LED intensity. The current reduction shall follow a non-linear curve that is high temperature biased. Thermal regulation of the drive current shall begin at 144 ° F and continue until a complete shutdown at 212 ° F. Recovery shall occur automatically with a reduction in the heat sink temperature.

A photoelectric cell and mounting shall be supplied with each IISNS.

6. Electrical:

The power supply shall be housed inside the sign frame assembly. Power supply shall be UL Class 2 limited output voltage and current plus isolation for safe operation, and UL Outdoor damp location rated. Power supply shall be IP66 Outdoor Rated.

a. Energy Requirements

The overall power required shall not exceed 2 Watts per square foot for the single sided signs.

b. Energy Star Partner

The sign shall be an Energy Star Qualified Product.
7. Quality Assurance:

Manufacturer must be ISO 9001 certified.

8. Warranty:

A five (5) year warranty shall be provided on the sign assembly.

**703.03 - Procedures - is amended as follows:**

(a) Prosecution of signal work- replace the third sentence of the first paragraph with the following:

Requests for any discontinuance shall be made at least 72 hours in advance to the City of Virginia Beach Traffic Engineering Division.

(a) Prosecution of signal work- add the following paragraphs

In the event the signal malfunctions, the Contractor shall be responsible for beginning such necessary repairs within two (2) hours from the time of notification. In the event the Contractor fails to arrive at the site and undertake the repairs within the specified time, or fails to complete the repairs within four (4) hours from the time of notification, the Owner reserves the right to make such repairs in accordance with Section 104.04

During the replacement or modification of an existing coordinated signal system, the Contractor shall maintain the existing system coordination, unless otherwise specified on the plans or directed by the Owner. In the event the operation of the existing coordinated system is disrupted due to damaged system equipment, interconnect cable or other facilities and the damage has been caused by the Contractor, then the Contractor shall be responsible for making repairs. The repairs shall be undertaken and completed in accordance with paragraph (j), Testing Equipment under Section 703.03.

(e) Installing signal heads - add the following paragraph

After the Owner has inspected and approved the final alignment of span wire, pole top and side pole bracketed vehicle and pedestrian signal heads, the Contractor shall secure the alignment to prevent twisting by drilling, tapping and installing stainless steel set screws in the slipfitter and pole, or cast nipple and hanger assemblies.

(e) Installing signal heads – is amended as follows

1. Vehicle traffic control signal heads – replace the third paragraph with the following paragraphs
a. Backplates shall be attached with bolts, washers and locknuts. Self-tapping screws shall not be permitted for attaching backplates. The number of bolts required for installation of backplates shall be at least eight (8) for a three section signal head assembly, ten (10) for a four section signal head assembly and twelve (12) for a five section signal head assembly. Bolts, washers and locknuts shall be of a noncorrosive metal or shall have a noncorrosive outside costing. Washers shall be placed on the inside and outside of the signal section and shall have a 1” minimum outside diameter.

703.03 - Procedures – *add the following paragraphs*

(k) **School Zone Caution Light Assembly**: School zone caution tight assembly shall operate to alternately flash two (2) 12” LED traffic signal head warning beacons during student arrival and departure periods on days when school is in session.

Work shall be performed in accordance with the requirements of the NEC and the standards of the local power company.

The assembly and its individual components shall be designed, constructed and assembled in accordance with the latest edition of AASHTO’s Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

School Speed Limit sign shall conform to the requirements of Section 701.

After energizing the school zone caution light assembly, the Contractor shall demonstrate to the Owner that electrical components are in proper working order. Faulty electrical components shall be repaired or replaced by the Contractor at his expense.

703.04 - Measurement and Payment – *is amended as follow*

**Local controller** - *replaces with the following pay item*

Controller will be measured in units of each and will be paid for at the contract unit price per each. The price shall include the controller, timing data, timing implementation, training, connecting cables, controller cabinet complete with back panels, traffic signal equipment cabinet power supply, GFCI and GFCI enclosure, power panels, telemetry panels, police panels, detector panels, detector rack, auxiliary panels, themostatically controlled fan unit in cabinet with vent, air filters, LED lamps(s), drawer, flash memory device, flasher, local flasher switch, radio frequency interference filters, signal load switches, bus interface unit (as required), main switches, police hand controls, malfunction management units/monitor unit(s), signal monitor units, flasher relay assemblies, power relays, signal control assemblies, lamp receptacle, ground fault convenience receptacles, circuit diagrams, conductor cables, grounding systems, transient protection devices, gaskets,
conduits, fittings, testing, warranty, flexible cables in the cabinet, termination of all field wiring and all incidental work and materials necessary to mount the cabinet and install the controller. When required by the contract, this price shall also include timing data, base adapter, and external communications interface box.

**Master controller** - replaces with the following pay item

**Master controller** will be measured in units of each and will be paid for at the contract unit price per each. This price shall include the controller, timing data, timing implementation, master controller unit (when a separate master controller unit is required), master controller unit functionality (when master controller functionality is combined with a local controller unit), controller cabinet complete with back panels, power panels, telemetry panels, detector panels, auxiliary panels, thermostatically controlled fan unit in cabinet with vent, circuit diagrams, manufacturer's instructions, necessary relays, accessory and specified auxiliary equipment, flexible cables in the cabinet, grounding system, transient protection devices, line interference protection devices, and wiring and incidental fittings necessary to install the control unit. When specified on the plans that this equipment will be furnished by the Owner, this item shall include pick-up of the equipment at the specified location and installation by the Contractor.

**Traffic signal head section** - replaces with the following pay item

**Traffic signal head assembly** will be measured in units of each and will be paid for at the contract unit price per each. This price shall include the signal sections, signal section mountings, LED module, molded terminal blocks, visors, louvers, backplates, all pipe, brackets, balance adjusters, tether wire attachments, leveling devices and incidental fittings necessary to mount the signals, realignments and optical adjustments.

**Pedestrian signal head** - replaces with the following pay item

**Pedestrian signal head assembly** will measured in units of each and will be paid for at the contract unit price per each. This price shall include the signal head(s), mountings, brackets, countdown LEDs, visors, louvers, molded terminal blocks, reflectors, hardware and fittings necessary to mount the signal assembly, and realignments and optical adjustments.

**Hanger assembly** - replaces with the following pay item

**Hanger assembly** shall not be measured for separate payment. The cost for these items shall be included in the contract unit bid prices for **Traffic signal head assemblies** and **Pedestrian signal head assemblies**.

**Loop saw cut** - replaces with the following pay item

**Loop saw cuts** shall not be measured for separate payment. The cost for this item shall be included in the contract unit bid price for Vehicle loop detector.

**Loop detector cable, lead-in cable, and preemption confirmation light cable** - add the following
Loop detector cable will not be measured for separate payment. The cost for this cable shall be included in the contract unit price of Vehicle loop detector.

Pedestrian actuation - replaces with the following pay item

Pedestrian push buttons will be measured in units of each and will be paid for at the contract unit price per each. This price shall include the pedestrian push button with freeze proof cover, cable guide, integral sign frame for mounting the sign, fittings for mounting, incidental fittings, sign panel(s) and when required, pole, caps, breakaway support systems, hand hole and cover, conduit, conduit, supplementary grounding electrode, grounding conductor, and concrete foundation.

703.04 - Measurement and Payment – add the following pay items:

Install Controller and Cabinet on Foundation will be measured in units of each and will be paid for at the contract unit price per each. This equipment will be furnished by the Owner or is existing equipment which is to be relocated. The price includes pick-up of the equipment at the specified location or relocation of the existing equipment and removal of the abandoned foundation, installation of all control equipment in the cabinet, application of a waterproof joint sealer between the cabinet base and the foundation, grounding systems, termination of all field wiring, testing, and all incidental work and materials necessary to mount the cabinet and install the controller.

Vehicle loop detector will be measured in units of linear feet of saw cut along the pavement to where it enters the conduit and will be paid for at the contract unit price per linear foot. This price shall include loop detector cable, pavement saw cutting, cleaning, drilling, disposal of excess material, backer rod, splice kits, splicing, testing and loop sealant material.

School zone caution light assembly will be measured in units of each and will be paid for at the contract unit price per each. This price shall include cabinets with programmable solid state time switches, flashers, flasher relay assemblies, radio interference filters, circuit breakers, lightning and surge protection, terminal blocks, ground fault convenience receptacle, school speed limit sign panel, warning beacons, indicator beacon, conductors and wiring connections between the cabinet and the warning beacons and indicator beacon, mounting and testing.

Internally illuminated street name sign shall be measured in units of each and will be paid for at the contract unit price per each. This price shall include sign housing, reflectors, sign panels, seals, LED’s, photoelectric controls, internal conductors, terminal blocks and compartments, mounting assemblies, powder coating, painting or sign housings and mounting assemblies when required, all labor, equipment and material necessary to install the signs and required design.

Drilling poles and furnishing and welding blind half couplings on poles for attachment of conduits and other fittings necessary for the installation of pole mounted controller cabinets, breaker boxes, safety switches, indicator beacons and service entrance heads will not be measured for separate payment, but will be considered incidental to other items of work.
Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
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<tr>
<td>Controllers</td>
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<tr>
<td>Master controller (furnish &amp; install)</td>
<td>Each</td>
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<tr>
<td>Master controller (install only)</td>
<td>Each</td>
</tr>
<tr>
<td>Traffic signal head assembly (sections, size &amp; mount configuration)</td>
<td>Each</td>
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<tr>
<td>Pedestrian signal head assembly (standard &amp; mount)</td>
<td>Each</td>
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<tr>
<td>Install controller and cabinet on foundation</td>
<td>Each</td>
</tr>
<tr>
<td>Pedestrian push button</td>
<td>Each</td>
</tr>
<tr>
<td>Vehicle loop detector</td>
<td>Linear foot</td>
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<tr>
<td>School zone caution light assembly</td>
<td>Each</td>
</tr>
<tr>
<td>Internally illuminated street name sign (Length)</td>
<td>Each</td>
</tr>
</tbody>
</table>

703.05 - Submittals and Certification - *add the following:*

703.05 - Submittals and Certification

Submit Shop Drawings of the following for approval:

(a) Controller units and auxiliary equipment

(b) Traffic signal heads

(c) Pedestrian signal heads

(d) Pedestrian push buttons and signs

(e) Hanger assemblies for mounting traffic signals, pedestrian signals and signs

(f) Vehicle loop detector materials including loop wire, loop sealant material, backer rod material and loop detector splice materials and kits

(g) Tether wire, including thimbleye bolt assemblies, dead ending devices and incidental fittings

(h) Span wire, including dead ending devices, conductor cable supports, thimbleye bolt assemblies and incidental fittings

(i) LED Module

(j) Cable terminal enclosures, including terminal blocks
(k) Illuminated traffic control signs
(l) Emergency Preemption
(m) Emergency Preemption Detector Cable
(n) Video Detection Equipment
(o) Video Detection Camera
(p) Monitor
(q) LED Internally Illuminated Street Name Sign
(r) School Zone Caution Light Assembly

Certification: The Contractor, with his associated material suppliers, shall provide certifications acceptable to the Owner that all materials supplied on this project meet or exceed the requirements of the plans and specifications.

SECTION 704 - PAVEMENT MARKINGS AND MARKERS

704.01 - Description – replaces with the following paragraph

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

704.02 - Materials – add the following paragraph

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

704.03 - Procedures - add to second paragraph after the first sentence

In addition to the above, Technicians installing preformed thermoplastic markings shall have received manufacturer’s instruction in the proper installation procedures.

704.03 - Procedures - add to third paragraph after the second sentence

These time limits shall also be applicable to newly resurfaced roadways.

704.03 - Procedures – is amended as follow:

(a) **Pavement Line Markings** – is amended as follow:
2. **Type B markings** - replaces the first paragraph with the following

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

   **Type B markings** – is amended as follows

   e. **Patterned preformed tape (Class VI)** - replaces the third, fourth, and fifth paragraph with the following

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

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

   f. **Polyurea (Class VII)** - replaces with the following

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

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

   (c) **Eradication:** - replaces the following paragraph

   **Eradication:** Eradication of pavement markings for restriping when required shall be in accordance with Section 512 except 100% removal of the existing markings is required.

   (d) **Pavement markers:** - add the following paragraph

   3. **Recessed pavement markers** shall be installed by cutting a slot in the pavement. The slot shall be parallel to the adjacent pavement marking.
slot shall be wide enough for the marker to fit freely into the slot and deep enough to allow the use of epoxy adhesive. The installed top of the marker shall be flush with the pavement surface or not more than 1/16” below the pavement surface.

The marker shall be bonded in the cut slot in accordance with the manufacturer's recommendations. Bonding material shall be from the Owner's approved list or as recommended by the manufacturer of the marker.

**704.04 - Measurement and Payment - replaces the second paragraph with the following**

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

**704.04 - Measurement and Payment – add the following pay items for payment**

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

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

**704.04 - Measurement and Payment - replaces the pay item table with the following**

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Type or class) Pavement line marking</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>(Type or class) Contrast Pavement Line</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>Pavement message marking (Message)</td>
<td>Each or Linear Foot</td>
</tr>
<tr>
<td>Pavement symbol marking (Symbol, type</td>
<td>Each</td>
</tr>
<tr>
<td>or class material)</td>
<td></td>
</tr>
<tr>
<td>(Type) Pavement marker (type pavement)</td>
<td>Each</td>
</tr>
</tbody>
</table>
704.05 - Submittals and Certification – *add the following:*

704.05 - Submittals and Certification

Submit Shop Drawings of the following for approval:

(a) Pavement line marking material
(b) Pavement message marking material
(c) Pavement primer
(d) Pavement markers and epoxy adhesive materials

Certification: The Contractor, with all associated material suppliers, shall provide certifications acceptable to the Owner that all materials supplied on the project meet or exceed the requirements of the plans and specifications.

**SECTION 705 - LIGHTING SYSTEMS**

705.03 - Procedures – *is amended as follow*

(g) **Electrical Equipment Containing Polychlorinated Biphenyl:** *add to the following paragraph*

Electrical equipment found in offset luminaires are excluded from the requirements and need not be inspected for PCB contamination.