

# 20231004 - October Specifications Committee Meeting

## October Specifications Committee Meeting Agenda

### Meeting Date

**Wednesday, October 4, 2023 @ 9:00am**

**Meeting Location: 1334 Smith Street, Charleston, WV in Lower Level Conference**

Also meeting virtually via Google Meet video conference. E-mail distribution message includes instruction.

### Approved Permanent Specification changes from last Committee meeting (08/02/23)

- **636.11-Flagger:** Clarifies flagger requirements on Interstate and/or Expressways.
- **Section 697-Bridge Safety Inspections:** New addition to spec book, for bridge inspection on any temporary bridge or stage construction of a new bridge.
- **106.3.1-Acceptance Plans:** Removes subsection from Acceptance Plans, as the aggregate gradation/price information is included in various sections of spec book.
- **401.2-Materials:** Removes a note (Note 1) from table that conflicts with gradation requirements in Section 703 for friable particles.
- **501.3-Proportioning:** Update allows use of reduce cement factor provided the aggregate used in those mix designs meet the requirements for optimized gradation of Section 601.2.4.1.
- **502.5-Joints:** Revises referenced subsection to appropriate location in Section 501.
- **601.3.1-Mix Design Requirements:** Add the Nominal Aggregate Size of different aggregate size depending on Class of concrete.
- **702.1.5-Mortar Strength:** Adds reference to MP 702.01.25 and Type IL cement.

### Approved Project Specific Special Provisions (SP) from last Committee meeting (08/02/23)

- **SP 601-Super Air Meter Testing**
- **SP 900-Railroad Protective Services - Norfolk Southern Railway Company**
- **SP 697-Bridge Safety Inspections**
- **SP 636-Automated Flagger Assistance Device**

### Items removed from Committee Agenda

- **None**

### Old Business-Provisions discussed at last Committee meeting

SECTION	TITLE	DESCRIPTION
<a href="#"><u>401</u></a>	<b>401.9.9-Material Transfer Vehicle</b>  <b>SP401-Material Transfer Vehicle</b>	<b>4<sup>th</sup> time to Committee; discussed in April, June, and August.</b>  Changes to Section 401-Asphalt Base, Wearing, and Patching and Leveling Courses adding Material Transfer Vehicle (MTV) requirements to equipment subsection of specifications. Also a special provision (SP) for when we want to specify the use of MTV on projects.

	J. Adkins	<p>Two items:</p> <ul style="list-style-type: none"> <li>• Specification; subsection 401.9.9-Material Transfer Vehicle</li> <li>• SP401-Material Transfer Vehicle</li> </ul> <p>Both provisions have been updated per comments at the last meeting.</p> <p>Approval is expected in October.</p>
<a href="#"><u>642</u></a>	<p><b>SP642-High Strength Silt Fence</b></p> <p>L. Rinehart</p>	<p><b>4th time to Committee; discussed in April, June, and August.</b></p> <p>Project Specific Special Provision for high strength silt fence.</p> <p>SP updated; it is the redline copy showing the revisions.</p>
<a href="#"><u>601</u></a>	<p><b>SP601-Galvanic Anode Protection</b></p> <p>Eric Williams, Vector Corrosion Technologies Inc.</p>	<p><b>3rd time to Committee; update of previously approved SP. Discussed in June and August.</b></p> <p>Project Specific Special Provision for galvanic anode protection. Updates the material requirements, installation requirements, and notes.</p> <p>SP updated; it is the redline copy showing the revision.</p> <p>Approval is expected in October.</p>
<a href="#"><u>601</u></a>	<p><b>SP601-Distributed Anode System</b></p> <p>Eric Williams, Vector Corrosion Technologies Inc.</p>	<p><b>3rd time to Committee; discussed in June and August.</b></p> <p>Project Specific Special Provision for distributed anode system.</p> <p>No update to the SP.</p> <p>Approval is expected in October.</p>
<a href="#"><u>101</u></a>	<p><b>101.2-Definitions</b></p> <p>J. Adkins</p>	<p><b>2nd time to Committee; discussed in August.</b></p> <p>Specification change to Section 101-Definition of Terms. The revision updates holidays to align with the way they are listed in state code and added the Day after Thanksgiving Day to the list.</p> <p>No update to the specification; it is the redline copy showing the revision.</p> <p>Approval is expected in October.</p>

<p><a href="#"><u>406</u></a></p>	<p><b>Section 406 - High Friction Surface Treatment</b></p> <p>B. Whelan</p>	<p><b>2<sup>nd</sup> time to Committee; discussed in August.</b> Proposed specification change adding High Friction Surface Treatment (HFST) to the specifications. This item has traditionally been utilized via SP 406.</p> <p>The specification has been updated; it is the redline copy showing the revisions to current SP.</p> <p><i>Approval is expected in October.</i></p>
<p><a href="#"><u>606</u></a></p>	<p><b>606.2-Materials</b></p> <p>S. Boggs</p>	<p><b>2<sup>nd</sup> time to Committee; discussed in August.</b> Specification change to Section 606-Underdrains. The update removes "Miscellaneous Concrete" from the material subsection as "Concrete for Miscellaneous Use" is also listed and both currently reference 715.12.</p> <p>No update to the specification; it is the redline copy showing the revision.</p> <p><i>Approval is expected in October.</i></p>
<p><a href="#"><u>607</u></a></p>	<p><b>607.2-Materials</b></p> <p>S. Boggs</p>	<p><b>2<sup>nd</sup> time to Committee; discussed in August.</b> Specification change to Section 607-Guardrail. The revision removes "Concrete for Footers" from the material subsection and clarifies "Concrete for Miscellaneous Use" and both currently reference 715.12.</p> <p>No update to the specification; it is the redline copy showing the revision.</p> <p><i>Approval is expected in October.</i></p>
<p><a href="#"><u>636</u></a></p>	<p><b>636.24-Basis of Payment</b></p> <p>S. Boggs</p>	<p><b>2<sup>nd</sup> time to Committee; discussed in August.</b> Specification change to Section 636-Maintaining Traffic. The revision updates payment of items after contract completion date.</p> <p>No update to the specification; it is the redline copy showing the revision.</p> <p><i>Approval is expected in October.</i></p>
<p><a href="#"><u>636</u></a></p>	<p><b>636.19.3.3-Digital Speed Limit Sign</b></p> <p><b>636.23.22-Portable Message Signs</b></p> <p><b>636.25-Pay Items</b></p> <p>J. Adkins</p>	<p><b>2<sup>nd</sup> time to Committee; discussed in August.</b> Specification change to Section 636-Maintaining Traffic. The revision adds digital speed limit sign item, for use on high speed, multi-lane highways, work areas.</p> <p>No update to the specification; it is the redline copy showing the revision.</p>

<a href="#"><u>709</u></a>	<b>709.46-Steel Posts, Post Braces and Gate Frames for Right-of-Way Fence</b>  J. Danberry	<b>2<sup>nd</sup> time to Committee; discussed in August.</b> Specification change to Section 709-Metals. The revision adds MP reference.  No update to the specification; it is the redline copy showing the revision.  <i>Approval is expected in October.</i>
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### New Business - New Provisions for Spec Committee

SECTION	TITLE	DESCRIPTION
<a href="#"><u>101</u></a>	<b>101.1-Abbreviations</b>  <b>401.9.7-Trucks for Transporting Mixture</b>  <b>707.1.1-Acceptance Requirements for Air Entraining Admixtures</b>  <b>708.3-Joint and Crack Sealant, Hot-Poured for Concrete and Asphalt Pavements &amp; 708.4.1.2-Test Requirements</b>  <b>709.1-Steel Bars for Concrete Reinforcement</b>  <b>711.5.3-Approval &amp; 711.23-Material/System Approval</b>  <b>715.4-Concrete Repair Materials, 715.9-Warning Devices, 715.11-Engineering Fabric, 715.14-Elastomeric Bearing Pads, &amp; 715.40-Pavement Marking Material</b>  D. Brayack	<b>1<sup>st</sup> time to Committee.</b> Seven specification changes to update terminology of AASHTO Product Evaluation and Audit Solutions (formerly National Transportation Product Evaluation Program - NTPEP): <ol style="list-style-type: none"> <li>1. 101.1-Abbreviations</li> <li>2. 401.9.7-Trucks for Transporting Mixture</li> <li>3. 707.1.1-Acceptance Requirements for Air Entraining Admixtures</li> <li>4. 708.3-Joint and Crack Sealant, Hot-Poured for Concrete and Asphalt Pavements &amp; 708.4.1.2-Test Requirements</li> <li>5. 709.1-Steel Bars for Concrete Reinforcement</li> <li>6. 711.5.3-Approval &amp; 711.23-Material/System Approval</li> <li>7. 715.4-Concrete Repair Materials, 715.9-Warning Devices, 715.11-Engineering Fabric, 715.14-Elastomeric Bearing Pads, &amp; 715.40-Pavement Marking Material</li> </ol> The specifications are redline copy showing the revision.

<a href="#"><u>101</u></a>	<b>101.2-Definitions</b>  J. Adkins	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 101-Definition of Terms. The revision is to correlate with recent Division personnel announcement.  The specification is the redline copy showing the revision.
<a href="#"><u>106</u></a>	<b>106.3-Samples</b>  D. Brayack	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 106-Control of Materials. The revision adds testing and material acceptance requirements.  The specification is the redline copy showing the revision.
<a href="#"><u>109</u></a>	<b>109.20-Weigh Tickets</b>  C. Harper	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 109-Measure and Payment. The revision adds weigh ticket requirements.  The specification is the redline copy showing the revision.
<a href="#"><u>402</u></a>	<b>402.2-Materials</b>  T. Ross	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 402-Asphalt Skid Resistant Pavement. The revision is to make the subsection better align with recent changes to 401.2.  The specification is the redline copy showing the revision.
<a href="#"><u>601</u></a>	<b>601.3.2.4.1-Optimized Aggregate Gradation</b>  A. Gillispie	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 601-Structural Concrete. The revision, revises error to 200 sieve and eliminate error with note 1 of Table 601.3.2.4.1B.  The specification is the redline copy showing the revision.
<a href="#"><u>625</u></a>	<b>Section 625-Rock Socketed Drill Shaft</b>  M. Nettleton	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 625-Rock Socketed Drill Shaft. The revision moves testing requirements responsibility to the contractor.  The specification is the redline copy showing the revision.
<a href="#"><u>679</u></a>	<b>SP679-Epoxy-Urethane Overlay</b>  K. Baranowski	<b>1<sup>st</sup> time to Committee.</b> Project Specific Special Provision for crack treatment and epoxy-urethane waterproofing overlay for bridge decks.
<a href="#"><u>703</u></a>	<b>703.1.5.2-Dolomite Limestone</b>  T. Ross	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 703-Coarse Aggregate. The revision clarifies that either ASTM test for elemental magnesium can be performed.  The specification is the redline copy showing the revision.

<a href="#"><u>707</u></a>	<b>707.2.2-Performance Requirements for Concrete Retarders</b>  J. Adkins	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 707-Concrete Admixtures, Curing and Coating Materials. The revision deletes a duplicated paragraph.  The specification is the redline copy showing the revision.
<a href="#"><u>715</u></a>	<b>715.9.6.1-Product Submission and Approval</b>  D. Brayack	<b>1<sup>st</sup> time to Committee.</b> Specification change to Section 715Miscellaneous Materials. The revision adds MP reference.  The specification is the redline copy showing the revision.
<a href="#"><u>900</u></a>	<b>SP900-Railroad</b>  Mark Young, Mott MacDonald	<b>1<sup>st</sup> time to Committee.</b> Project Specific Special Provision for replacement of various railroad elements.

### Comments

Comments are requested on these Specifications Changes and Project Specific Special Provisions. Please share your comments by **September 29, 2023**, they help in the decision making process.

Please Send Comments to: [Steve.D.Boggs@wv.gov](mailto:Steve.D.Boggs@wv.gov)

### Deadline for new items & updates to these provisions is **November 11, 2023**.

If you are the 'champion' of any specification changes and/or project specific special provisions currently in the Specification Committee, it is your responsibility to edit/update/modify them in a timely manner per comments and discussion in Spec Committee. *Failure to submit updates may result in removal of item and/or delays.*

### Next Meeting

Wednesday, **December 6, 2023 at 9:00 a.m.**

Meeting will be held virtually via Google Meet video conference. E-mail distribution message includes instruction.

### Specification Webpage

The Specification page is here:

<https://transportation.wv.gov/highways/TechnicalSupport/specifications/>

### 2023 Standard Specification Roads and Bridges

Electronic copy (pdf): The 2023 Standard Specifications Roads & Bridges is posted on the Publications page under Specifications.

Print Version: We are working on getting the book printed and will provide an update during the meeting.

### 2024 Specifications Committee

The Specification Committee typically meet every other month; on the first Wednesday. 2024 meetings will be held in February (2/7), April (4/3), June (6/5), August (8/8), October (10/2), and

December (12/4).

*Calendar subject to change, updates will be given, as needed.*

## **Specifications Committee Website**

A copy of the meeting agenda can be found on the Specifications Committee Website

<https://transportation.wv.gov/highways/TechnicalSupport/specifications/SPECCOMIT/Pages/default.aspx>

## **Materials Procedures**

Material Procedures (MPs) referenced in provisions are available upon request.

For questions regarding the Standard Specifications Road and Bridges, Supplemental Specifications, Project Specific Provisions, or the Specifications Committee please email [Steve.D.Boggs@wv.gov](mailto:Steve.D.Boggs@wv.gov).

## **File Format Structure and Progression of items thru Specifications Committee**

The purpose of the below protocol is to provide guidance on the file structure of Proposed Specifications & Project Specific Provisions as they progress thru Specifications Committee. This procedure would facilitate a means of tracking changes from meeting to meeting; as the agenda & provisions are posted publicly online on the Spec Committee website.

### **TYPES OF PROVISIONS:**

There are three standard types of provisions typically discussed in committee:

1. Specification Changes – These are permanent changes to the WVDOH Standard Specifications.
  - Unless inserted into a project proposal, these changes typically go into effect in January (of subsequent year) with the Supplemental Specifications
2. Project Specific Special Provisions (SP) – Are applied to specifically designated projects.
3. Updates to previously approved SP – Changes/edits/updated to SP that have been approved by spec committee.

### **NEW BUSINESS ITEMS:**

New items should be setup & submitted in the following format:

1. Specification Changes – Show as red-line copy (see note)
2. Project Specific Special Provisions (SP) – Will be shown in all black.
3. Updates to approved SP – Shown as red-line copy.

Each item should also include a description with:

- Brief overview of item
- Background info and/or reason for change

NOTE: Red-line copy is a form of editing which indicates removal or addition of text. You can redline a Microsoft Word document by using the built-in “Track Changes” feature or you can manually reline document with font color changes & strike-through.

### **OLD BUSINESS ITEMS:**

Updated provisions that were discussed at the last committee meeting should be setup in the following format:

- Redline copy from prior meeting would not be shown
- Redline copy of new changes/updates (from previous meeting)

**PROGRESSION OF ITEMS THRU COMMITTEE AND APPROVAL:**

Depending on how important the project and/or comments/discussion of item at previous meeting, then several things can happen in no particular order.

- Few comments/discussion/minor changes...will recommend approval of item at next meeting
- A lot of comments/discussion...will not recommend approval at next meeting; item will be updated and reviewed again at the next meeting.
- SP's in committee may be used in advertised project. Hope to work to address comments & finish approving at subsequent meeting.



WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 401

ASPHALT BASE, WEARING, AND  
PATCHING AND LEVELING COURSES

**401.9-EQUIPMENT:**

DELETE SUBSECTION 401.9.10 AND REPLACE WITH THE FOLLOWING:

**401.9.10-Material Transfer Vehicle:** A Material Transfer Vehicle (MTV) shall be designed to independently transfer and continuously mix asphalt concrete to mitigate thermal and particle size segregation when transferring from the haul equipment to the paving equipment.

An MTV shall have a high-capacity truck unloading system be capable of receiving and transferring material at a rate that exceeds the capacity of the delivery and paving equipment, and have a minimum combined capacity of 15 tons of asphalt concrete, including the MTV storage bin and hopper. An MTV shall include a system contained within an integrated storage bin which continuously mixes the asphalt concrete prior to discharge to the paving equipment. Additionally, the MTV should have a discharge conveyor with the ability to swivel to allow for the delivery of material to the paver while the MTV operates from an adjacent lane.

The MTV shall be maintained and in proper working condition.

**401.9.10.11-Compaction Equipment:** Compaction shall be performed by self-propelled steel-wheeled or pneumatic-tired rollers. The use of either vibratory or oscillatory type rollers is acceptable. Pneumatic rollers shall be equipped with skirting around the wheel area to prevent heat loss to the tires and tire pads. Hand-held rollers or vibrating plates may be used in small inaccessible areas as approved by the Engineer. Prior to use on any project, the roller shall be inspected to see that it is in good mechanical condition. The total weight, weight per inch of width (steel-wheeled), and average ground contact pressure (pneumatic-tired) shall be documented in the contractors QCP in accordance with MP 401.03.50.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SPECIAL PROVISION**

**FOR**

**STATE PROJECT NUMBER:** \_\_\_\_\_

**FEDERAL PROJECT NUMBER:** \_\_\_\_\_

**SECTION 401  
ASPHALT BASE, WEARING, AND  
PATCHING AND LEVELING COURSES**

**401.1-DESCRIPTION:**

ADD THE FOLLOWING:

**401.1.1-Materials Transfer Vehicle:** This work shall consist of the use of a Materials Transfer Vehicle (MTV) for transferring asphalt concrete from hauling equipment to the paver during construction. An MTV, as defined in Section 401.9.10, contributes to an efficient non-stop paving operation by reducing thermal and particle size segregation in the material, both of which adversely affect the smoothness and durability of the final pavements. The work shall be constructed in accordance with these specifications and the applicable requirements of Section 401, or 402, ~~or 410~~ of the Specifications.

**NOTE:** Asphalt paving applications suitable for MTV shall be used on the mainline of the traveled way. MTVs may also be included on all ramps, full width acceleration lanes, full width deceleration lanes and full width turn lanes that are greater than 1000 feet in length. At the Engineer's discretion, isolated portions of a project may be exempt from use of the MTV if the weight or operation of the MTV is detrimental to the roadway.

**401.13-BASIS OF PAYMENT:**

ADD THE FOLLOWING:

No additional measurement is necessary nor will additional compensation be allowed for use of an MTV on the project.

**Appendix 401A.** This sheet is not required with PS&E submission.:

Designer Note: This specification requires use of MTV on paving projects. It is intended for only specified projects which meet criteria listed below. ~~However, the designer needs to be aware of site conditions, such as weight/height of the MTV, should be considered during project selection.~~ In addition to the requirements listed below, the designer needs to consider site conditions of the project, noting the height and weight of an MTV, and how that may impact project selection. If an MTV is used for a project, it shall meet all of the following requirements:

When to use:

- The design speed is equal to or greater than 35 mph.
- The project length is a minimum of one (1) mile of continuous pavement.
- The total tonnage of all ~~asphaltic~~ asphalt concrete is greater than 2000 tons.

Where to use:

- Mainline of the traveled way.
- Ramps, full width acceleration lanes, full width deceleration lanes and full width turn lanes that are greater than 1000 feet in length.

Do not use the MTV for the following conditions:

- A project with lane width that is equal to or less than 11 ft.
- A passing lane only project.
- PWL Projects (Section 410- Asphalt Base and Wearing Courses, Percent with Limits (PWL)).
- Scratch Courses and Patching and Leveling Courses

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: \_\_\_\_\_

FEDERAL PROJECT NUMBER: \_\_\_\_\_

SECTION 642  
TEMPORARY POLLUTION CONTROL

642.6-TEMPORARY PIPE, CONTOUR DITCHES, BERMS, SLOPE DRAINS, ROCK CHECK DAM, SILT FENCE, AND SUPER SILT FENCE:

ADD THE FOLLOWING SUBSECTION:

**642.6.7-High Strength Silt Fence:** 32” to 48” high Reinforced High Strength Silt Fence is a heavy-duty, high-tensile/ high-modulus, geotextile sediment fence. Designed using a value engineering approach, it is equivalent in strength and stiffness to that of ~~wire or chain link backed silt fence~~ Super Silt Fence (Item 642015-001). The purpose, design, material selection, installation, and maintenance of a High Strength Silt Fence when used as a temporary sediment control barrier for sheet flow applications to minimize sediment transport from a disturbed area susceptible to erosion.

642.7-METHOD OF MEASUREMENT:

ADD THE FOLLOWING SUBSECTION:

**642.7.2-Reinforced High Strength Silt Fence:** Excavate trench a maximum of 4” wide. The fabric shall be buried at a depth as recommended by the manufacture’s recommendations and shall not be less than 6” deep. The trench shall be ~~hand~~ cleaned following excavation to remove bulky debris such as rocks, sticks, and soil clods. Roll out the fence on the ground along the proposed fence line and next to the anchor trench. For the initial post, place the end of ~~Reinforced~~ High Strength Silt Fence along the post height and rotate the post two full 360 degrees, maintaining tension on the fabric. Secure the fence to the post at all reinforcing band locations as recommended by the manufacturer (no less than four locations along the length of the exposed portion of the post) with steel wire (metal T-posts using 16-gage 304 SS wire with

mitered ends, securing with safety pliers) or nylon ties (puncture two 0.25” openings, spaced at a width apart that is roughly equivalent to the post width, and secure the fence to the post using 8” nylon heavy-duty cable ties/zip-ties that are UV resistant and have a minimum 120-lb tensile strength). Metal T-posts shall conform to the requirements of either AASHTO M 281 / ASTM A702 or ASTM A499 and coated to meet the requirements of AASHTO M 111 unless otherwise directed on project plans.

Drive the initial post to the depth as recommended by the manufacture of the High Strength Silt Fence or (72” metal t-post) ~~with the attached fence~~ to a depth of 36” below surface. Using spacing no greater than 6 feet on center, drive interior posts to 36” depth below surface, and attach the fencing as you go. To attach fencing, position 32” to 42” high Reinforced High Strength Silt Fence in front of the adjacent t-post, pulling the fencing tight and fasten it to the post as recommended by the manufacturer (no less than at all four reinforcing band locations). After the interior posts have been fastened, secure the fence to the final post by pulling the final section of fencing taut, and then rotating the post 360 degrees while maintaining tension on the fence system. Secure the fence to the post as recommended by the manufacturer (no less than four locations) with the steel wire or nylon ties. Drive the final post into the ground as recommended by the manufacturer or to a 36” depth below the surface. The ~~woven~~ geotextile fence shall be specifically designed and fabricated to withstand high tensile stresses and to prevent excessive material elongation and strain. It shall resist fence deflection and ultimate failure due to ripping, sagging or overturning from forces associated with excessive backwater depths, debris flows and overtopping. Ensure bottom ~~6” to 8”~~ of fabric has been placed in trench as recommended by the manufacturer no less than 6” deep. Backfill trench (overflow) with soil placed on and around fabric as shown in the diagram below. Compact soil backfill manually or via mechanical compactor or other device (ASTM D 6462 Standard Practice for Silt Fence Installation).

## BURY FILTER CLOTH MINIMUM TO GROUND

6” to 8”



The High Strength Silt Fence shall have Fencing and Filter Fabric that is 32” to 36” above ground with filter fabric extending as recommended by the manufacturer no less than 6” to 8” below ground surface.

The High Strength Silt Fence shall meet at least the strength and retention characteristics of Super Silt Fence Item 642015-001.

~~Wide width tensile strength ASTM D 4595 (>5000 lbs/ft MD, >3500lbs/ft TD).~~

~~Wide Width Test Elongation ASTM D 4595 (< 10% MD, <9% TD).~~

~~Grab Tensile Strength ASTM D 4632 (>500 lbs. MD, >280 TD).~~

~~CBP Puncture ASTM D 6241 (>1800 lbs.).~~

~~Trapezoidal Tear ASTM D 5433 (>195 lbs. MD, >170lbs. TD).~~

~~Mullen Burst ASTM E 3786 (>750 psi).~~

~~Apparent Opening Size ASTM D 4751 (Sieve #70).~~

~~Water Flux ASTM D 4491 (>18 gpm/sf). UV Stability ASTM D 4355 (>90% strength retained Machine Direction).  
(MD=Machine Direction, TD=Traverse Direction)~~

Once sedimentation has reached a third of the ~~Reinforced~~ High Strength Silt Fence height, all accumulated sediment shall be removed and disposed of as directed by the Engineer. The Contractor shall inspect all silt fences after each rainfall event of at least 0.25 inches or greater. Any deficiencies or damage shall be repaired by the Contractor. If the ~~Reinforced~~ High Strength Silt Fence height is damaged or inadvertently moved during the sedimentation removal process, the contractor shall replace and/or repair any ~~Reinforced~~ High Strength Silt Fence immediately after the damage occurs. The Contractor shall be responsible for all details, devices, accessories, and special construction necessary to properly furnish, install, adjust and place in continuous satisfactory service, and complete the work in an acceptable manner.

#### 642.8-BASIS OF PAYMENT

ADD THE FOLLOWING SUBSECTION:

**642.8.1-High Strength Silt Fence:** ~~Reinforced~~ High Strength Silt Fence shall be measured by the linear foot complete and in place ~~Reinforced~~ High Strength Silt Fence shall be paid per Linear Foot or Units as shown in the plans and/or other Erosion and Sediment Control Specifications as referenced in the plans.

#### 642.9-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
642015-005	High Strength Silt Fence	Linear Foot

DRAFT

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SPECIAL PROVISION**

**FOR**

**STATE PROJECT NUMBER:** \_\_\_\_\_

**FEDERAL PROJECT NUMBER:** \_\_\_\_\_

**SECTION 601  
STRUCTURAL CONCRETE**

**601.1-DESCRIPTION:**

ADD THE FOLLOWING TO THE END OF THE SECTION:

**601.1.1-Embedded Galvanic Anodes:** This work consists of installing embedded galvanic anodes in conjunction with Patching Concrete Structures (removing all loose, disintegrated, and delaminated concrete; preparing the surface; furnishing and placing reinforcing steel as required; placing forms; and placing concrete patches, including curing of same).

**601.2-MATERIALS:**

ADD THE FOLLOWING TO THE END OF THE SECTION:

Furnish pre-manufactured galvanic anodes designed for controlling corrosion when embedded in concrete and tied to steel reinforcing. The core of the anode shall consist of a minimum of 160 grams of electrolytic high grade zinc in compliance with ASTM B418 Type II cast around steel tie wires and encased in a highly alkaline cementitious shell with a pH of 14 with sufficient alkalinity to assure performance over the 20 year design life of the anode. The galvanic anode shall contain no intentionally added constituents which are corrosive to reinforcing steel, e.g. chloride, bromide, etc. The anodes shall have one side that is less than 1½-inches in height.

Furnish galvanic anodes in accordance with these specifications. Supply a certification of compliance that the anode and spacing meets the basis of design to the engineer before starting work. Deliver, store, and handle all materials according to the manufacturer's instructions.

Repair concrete shall be hydraulic cement-based material with a 28-day moist cured electrical resistivity less than 50,000 ohm-cm according to ASTM-~~C1760~~ C1876. Concrete mixes

containing high levels of supplementary cementitious materials such as silica fume, ground-granulated blast furnace slag, fly ash or metakaolin may not meet the resistivity requirement. Insulating materials such as epoxy bonding agents shall not be used unless otherwise called for in the design.

#### **601.10-PLACING CONCRETE:**

DELETE THE TITLE AND CONTENTS OF SUBSECTION 601.10, AND REPLACE WITH THE FOLLOWING:

#### **601.10-GALVANIC ANODE INSTALLATION:**

Install embedded galvanic anodes in accordance with manufacturer's recommendations, as shown on the plans, and as listed in this specification.

1. Install galvanic anodes to existing reinforcement along the perimeter of the repair at spacing as specified on the plans. In no case shall the distance between anodes exceed 28 inches. Keep the anodes as close to the edge of the repair as practical while allowing for new mortar to completely encapsulate the anodes, with a least 4 inches around anodes.
2. Provide a 1-inch clearance between anodes and substrate to allow repair material to encase anode. Ensure that there is at least 1-inch cover over the anode. If necessary, increase the size of the repair cavity to accommodate the anodes.
3. Secure the galvanic anodes as close as possible to the patch edge using the anode tie wires (bare wire). Wrap tie wires around the cleaned and uncoated reinforcing steel at least one full turn in opposite directions and then tighten the tie wires to allow little or no free movement. If the anode is to be tied onto a single bar, or if less than 1½-inch of concrete cover is expected, place anode beneath the uncoated bar and secure to reinforcing steel. If 1½-inch concrete cover will exist over the anode, the anode may be placed at the intersection between two bars and secured to each bar.

Confirm electrical connection between every anode tie wire and uncoated reinforcing steel with a multi-meter. Electrical connection is acceptable if the DC resistance measured with the multi-meter is 1 Ohm or less or the DC potential is 1 mV or less. Confirm electrical continuity of every exposed uncoated reinforcing steel within the repair area. Steel reinforcement continuity is acceptable if the DC resistance measured with the multi-meter is 1 Ohm or less or the DC potential is 1 mV or less. If necessary, establish the electrical continuity with uncoated steel tie wire.

Provide the Engineer with a report documenting the resistance measurement for every reinforcing bar in each repair area. The report shall be signed by the contractor's employee responsible for supervision of the repair work.

The contractor will have a representative from the galvanic anode manufacturer to provide training and on-site technical assistance during the initial installation of the galvanic anodes.

#### **601.14-METHOD OF MEASUREMENT:**

DELETE THE ENTIRE SECTION:



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**601.15-BASIS OF PAYMENT:**

ADD THE FOLLOWING TO THE END OF THE SECTION:

This work shall be paid for as Item 601030-025, Galvanic Anode Protection, per Each. It will include all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

**NOTE:** Anode spacing shall be specified by the designer. Anode spacing is dependent upon the reinforcing steel density; the level of corrosion risk (i.e. amount of chloride and the corrosivity of the local environment); and amount of zinc per anode. The density of the reinforcing steel is the total surface area of the bar (ft<sup>2</sup>) within a square foot of concrete (regardless of depth).

Corrosion levels in the concrete can be broken into three measurable categories based on ASTM C1152 Acid-Soluble Chloride of Mortar and Concrete:

- Low to Moderate corrosion levels: < 5 lb/yd<sup>3</sup>.
- High corrosion levels 5 to 9 lb/yd<sup>3</sup>.
- Extremely High corrosion levels: > 9 lb/yd<sup>3</sup>.

In lieu of coring to determine chloride thresholds, the following general guidelines may be considered:

- Light corrosion for concrete aged 0-15 years and exposed to deicing salt or concrete of any age not directly exposed to deicing salt.
- Moderate corrosion for concrete aged 16-30 years and exposed to deicing salt.
- High corrosion for concrete 31 years and older and exposed to deicing salt.

The basis of design is as follows:

- Anode: Type 1A Embedded Galvanic Anode with a minimum of 160 grams of zinc.
- Service Life: 20 years minimum
- Efficiency\*Utilization Factor: 85%
- Minimum current density delivered 4 inches outside the edge of repair in the parent concrete between anodes:
  - Low to Moderate Risk – 0.4 mA/m<sup>2</sup> of steel surface area
  - High Corrosion Risk – 0.8 mA/m<sup>2</sup>
  - Extremely High Risk – 1.6 mA/m<sup>2</sup>
- Anode aging factor: 12.5 years (Approximate half-life, the time when anode current drops by 50%)

Steel Density Ratio  (Steel Surface Area divided by concrete surface area)	Basis of Design / Anode Spacing (Inches)		
	Low to Moderate Corrosion Risk  (0.4 mA/m <sup>2</sup> @ 20 years)	High Corrosion Risk  (0.8 mA/m <sup>2</sup> @ 20 years)	Extremely High Corrosion Risk  (1.6 mA/m <sup>2</sup> @ 20 years)
< 0.3	28	28	25
0.31 – 0.6	28	25	17
0.61 – 0.9	28	20	14
0.91 – 1.2	25	17	11
1.21 – 1.5	22	15	10
1.51 – 1.8	20	14	9
1.81 – 2.1	19	13	8

- Alternate (or equal) anodes shall provide design details based on the following factors:
  - Initial and final current to steel from field monitoring.
  - Anode aging factor base on continual monitoring of field installations sufficient to determine the actual half-life of the anode in field installations. If insufficient data exists to determine anode aging factor, an anode aging factor of 4 years shall be used.
  - Efficiency\*Utilization factor determined by removing anodes from field installation and measuring actual versus theoretical zinc consumption.
  - Anode spacing to achieve specified current density at 20 years.

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**601.16-PAY ITEMS:**

DELETE THE CONTENTS AND ADD THE FOLLOWING TO THE TABLE:

<b>ITEM</b>	<b>DESCRIPTION</b>	<b>UNIT</b>
601030-025	Galvanic Anode Protection	Each

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SPECIAL PROVISION**

**FOR**

**STATE PROJECT NUMBER:** \_\_\_\_\_

**FEDERAL PROJECT NUMBER:** \_\_\_\_\_

**SECTION 601  
STRUCTURAL CONCRETE**

**601.1-DESCRIPTION:**

ADD THE FOLLOWING TO THE END OF THE SECTION:

**601.1.1-Distributed Anode System (DAS):** The work under this section consists of supplying, installing, and energizing a zinc-based galvanic corrosion protection system, including required electrical connections, materials, testing, and ensuring continuity of the reinforcing steel to all elements as outlined in the construction drawings.

Distributed embedded galvanic anodes are designed to provide galvanic corrosion protection. The anodes are connected to reinforcing steel and embedded in concrete to mitigate corrosion.

**601.2-MATERIALS:**

ADD THE FOLLOWING TO THE END OF THE SECTION:

The distributed galvanic anode units shall be alkali-activated with a pH greater than 14 and shall not contain intentionally added constituents that are corrosive to reinforcing steel as per ACI 222R such as chlorides, bromides, or other halides. The anode core shall be manufactured with zinc in compliance with ASTM B418 Type II (Z13000) with iron content less than 15 ppm and that is evenly distributed around a steel core which is continuous along the length of the unit. Unless otherwise specified, the anode unit shall be supplied with a pair of uncoated steel tie wires with optional loop ties to make connections to the reinforcing steel.

Individual anode units shall be based on the sizes in Table 601.15 and information that will be called out in plan drawings. The typical length of individual anode units shall be 39 inches, unless otherwise noted in the plans. Anode units shall be supplied with uncoated, steel tie wires

for either direct connection to the steel or connection to an inter-anode connecting header wire as per the design.

Distributed galvanic anodes shall be Galvashield DAS or approved equal.

The spacing of the distributed galvanic anode units will be as per the outlined design.

Application for approved equals shall be requested in writing two weeks before submission of project bids. Application for galvanic anode approved equals shall include verification of the following information:

1. Type of activation mechanism must be stated and demonstrated.
2. The distributed anode contains no intentionally added constituents corrosive to reinforcing steel or detrimental to concrete, e.g. chloride, bromide, sulfate, etc.
3. Initial startup current per anode per area at specified average annual temperature of structure.
4. Aging term - This is the number of years over which the electric current produced by the installed anode drops to half of the initial measured current.
5. Submittal of monitored performance data for two examples of satisfactory field performance where said aging term has been achieved.
6. Initial mass of zinc.
7. Efficiency and utilization determined from site performance data of no less than seven years.
8. Anode units contain zinc around uncoated, (non-galvanized) steel tie wires.
9. Third party product evaluation, such as from Concrete Innovations Appraisal Service, BBA, etc.
10. Using the information above, model how the alternative design will meet the minimum current density at the end of life of per design.

#### **601.10-PLACING CONCRETE:**

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

#### **601.10-DISTRIBUTED ANODE SYSTEM (DAS) INSTALLATION:**

The galvanic corrosion protection system shall consist of alkali-activated distributed galvanic anodes placed either evenly across the concrete surface or in a single line, per plan drawings. The anode units are connected to the reinforcing steel to be protected and encased in concrete with a minimum of 1 ½ inch of clear concrete cover over the anode units. After the anode units are installed and encased in concrete, the system provides galvanic protection to the embedded reinforcing steel.

Remove loose or delaminated concrete. Use the smallest practical size chipping hammer to minimize damage to sound concrete.

Clean exposed reinforcing steel of rust, mortar, etc. to provide sufficient electrical connection and mechanical bond. If a significant reduction in the cross section of the reinforcing steel has occurred, replace, or install supplemental reinforcement as directed by the engineer of record. Secure loose reinforcing steel by tying tightly to other bars with steel tie wire. Verify electrical continuity of all reinforcing steel, including supplemental steel.

Reinforcing steel shall be tested for electrical continuity by procedures as directed by the cathodic protection technician. Electrical connection is acceptable if the DC resistance measured with the multi-meter is 1 W or less or the DC potential is 1 mV or less. Reinforcing steel found to be discontinuous shall be bonded to continuous reinforcement by steel tie wire.

Any new steel added to the structure, such as supplemental reinforcing, wire mesh or rebar shall be electrically continuous. The new steel shall be connected to the anode grid or bonded to existing reinforcing steel. After the distributed galvanic anodes are installed, the continuity of the connection between anode tie wire and reinforcing steel is verified using the same procedures prior to concrete placement.

Distributed anodes shall be placed in locations as per the design and indicated on the drawings. Secure anodes to prevent movement during concrete placements.

The distributed anode system must be connected to the reinforcing steel to be protected. The anodes are directly tied to cleaned exposed steel or can be interconnected to header wires to create a distributed anode grid. The anode grid shall be connected to reinforcing steel with a minimum of two connections per 500 ft<sup>2</sup> of concrete area.

If no exposed steel exists after preparation of the substrate, a small area of concrete shall be removed to expose reinforcing steel for anode connection. Electrical connections to the reinforcing steel shall be established by tying the header wire to the exposed steel or by alternate methods. Proposed electrical connection details shall be approved by the anode manufacturer and shall be detailed on the shop drawing submittal for approval by the engineer.

After the distributed galvanic anodes have been installed. Place approved concrete taking care to avoid damage to the anodes, connections, and wiring. Consolidate concrete around anodes assuring no voids exist. For vertical and overhead repairs like columns and beams, minimum concrete cover depth over the anodes shall be ¾ inches. For horizontal applications like bridge deck overlays and joint replacements, minimum concrete cover depth over the anodes shall be 1.5 inches.

**601.10.1-Manufacturer Technical Assistance:** The contractor will enlist and pay for the services of a NACE-qualified cathodic protection technician (CP2 or greater) supplied by the galvanic anode manufacturer. The qualified corrosion technician shall have verifiable experience in the installation and testing of embedded galvanic protection systems for reinforced concrete structures.

The technician shall provide contractor training and support for development of application procedures, shop drawings for submittals, anode, and concrete installation, reinforcing steel connection procedures, and verification of electrical continuity of embedded steel. The contractor shall coordinate its work with the designated technician to allow for site support during project startup and initial anode installation.

#### **601.15-BASIS OF PAYMENT:**

ADD THE FOLLOWING TO THE END OF THE SECTION:

This work shall be paid for as Item 601030-030, Distributed Anode System (DAS), per Lump Sum. It will include all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

**TABLE 601.15**

<p><b>NOTE:</b> <i>Typical Distributed Anode System (DAS) Sizes and Weights:</i></p> <ul style="list-style-type: none"> <li>• <i>Lengths: Standard 39 inches but can be customized to project requirements.</i></li> <li>• <i>Nominal Dimensions ***:</i>  <b>DAS:</b>  <i>0.6 lb./ft.</i>  <i>1.1" x 1.5"</i></li>   <li><b>DAS-X:</b>  <i>1.65 lb./ft.</i>  <i>1.25" x 2"</i></li>   <li><i>*** Typically, +/- 1/8"</i></li>   <li><i>Design based on aging term of 12.5 years and an efficiency/utilization of 75%.</i></li> </ul>		
<b>Corrosion Risk Category</b>	<b>Chloride Level *</b>	<b>Minimum Current Density at end of life **</b>
Low to Moderate	<5lbs/yd <sup>3</sup>	0.6mA/m <sup>2</sup> (0.06mA/ft <sup>2</sup> )
High	5-9lbs/yd <sup>3</sup>	1.2mA/m <sup>2</sup> (0.11mA/ft <sup>2</sup> )
Extremely High	>9lbs/yd <sup>3</sup>	2.4mA/m <sup>2</sup> (0.22mA/ft <sup>2</sup> )
<p><i>* Chloride content is based on lb/yd<sup>3</sup></i></p> <p><i>** Designer to specify end of life minimum current</i></p>		

**601.16-PAY ITEMS:**

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
601030-030	Distributed Anode System	Lump Sum

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 101

DEFINITION OF TERMS

101.2-DEFINITIONS:

ADD THE FOLLOWING TO THE DEFINITION OF HOLIDAY:

**Holidays**-Official holidays are New Year's Day, Martin Luther King's Birthday, ~~Jr. Day~~, President's' Day, Memorial Day, West Virginia Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, The day after Thanksgiving Day (Lincoln's Day), Christmas Day, and any day in which an election (Primary, ~~or~~ General, or Special) is held throughout the State and such other days as the President, Governor, or other duly constituted authority shall proclaim to be holidays. If a holiday falls ~~on~~ on a Sunday, the following Monday shall be observed in lieu thereof. If a holiday falls on a Saturday, the previous Friday shall be observed in lieu thereof.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**SUPPLEMENTAL SPECIFICATION**

**FOR**

ADD THE FOLLOWING SECTION:

**SECTION 406**  
**HIGH FRICTION SURFACE TREATMENT**

**406.1-DESCRIPTION:**

This work shall consist of the construction of a high friction surface treatment (HFST) material, composed of binder material and aggregate, upon an existing surface, in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses, and cross sections shown on the Plans or established by the Engineer.

The Contractor shall notify the Engineer a minimum of two weeks prior to starting any high friction surface treatment operation.

~~406.1.1-Interim Completion Date / Overall Completion Date: When specified, the Contractor shall complete HFST work by interim completion date of: \_\_\_\_\_. The Contractor shall be assessed liquidated damages per Section 108.7.1 for each calendar day that the HFST work is not complete.~~

~~The overall completion date will be 1 year after interim completion date and allow for final skid testing.~~

**406.2-MATERIALS:**

~~The binder and aggregate shall meet the requirements of AASHTO MP-41, shall be a multi-component modified exothermic polymer resin binder treatment. The binder shall cure exothermically and hold the aggregate firmly in position and meet the following requirements:~~



**TABLE 406.2A-MULTI-COMPONENT MODIFIED BINDER RESIN SYSTEM**

<b>Property</b>	<b>Test Method*</b>	<b>Specification Limits</b>
Viscosity	ASTM D2556	7–30 P
Durometer Hardness	ASTM D2240	60–80
Cure Rate (Dry through time)	ASTM D1640	3 hours max.
Adhesive Strength	ASTM C1583	250 psi min. (100% substrate failure)
Compressive Strength		1,000 psi (@ 3 hours 5,000 psi @ 7 days)
Elongation at break point	ASTM D638	30% min.
Gel Time	ASTM C881	10 minutes min.
Water Absorption	ASTM D570	1% max.
Mixing Ratio	Per Manufacturer’s Recommendations	

\*Additional testing notes for laboratory: Prepare all samples per manufacturer’s recommendation.

- Viscosity—prepare one pint sample and mix for 2 to 3 minutes before testing. Use X1.1 for spindle selection and test at a temperature of 73 ± 2°F.
- Gel Time—Prepare a 60 g sample per manufacturer’s recommendation. Perform testing at a temperature of 73 ± 2°F.
- Cure Rate—Prepare specimens of 50–55 wet mil thickness.
- Cure the following test specimens for 7 days at 73 ± 2°F, and test immediately without delay.
- Durometer Hardness—Use the type 1 precision type D method.
- Compressive Strength—Prepare specimen according to Method “B”, 2” x 2” cube, using 2.75 parts of sand to one part mix polymer resin by volume. Sand must conform to ASTM C778, 20–30 sand.
- Ultimate Tensile Strength—Prepare Type 1 specimens in accordance to ASTM D638.
- Elongation at break point—Prepare Type 1 specimens in accordance to ASTM D638.

—The aggregate shall be bauxite material that is clean, dry and free from foreign matter and meets the following requirements:

**TABLE 406.2B-AGGREGATE**

<b>Property</b>	<b>Test Method*</b>	<b>Specification Limits</b>
SFC—Side Force Coefficient	ASTM E670	0.70 minimum
SRV/SRT—Skid Resistance Value Test	ASTM E274	65.0 mm min (70 mm)
AAV—Aggregate Abrasion Value	AASHTO T 96	20.0 max.
Aggregate Gradation	AASHTO T 27	95.0–100.0% Passing No. 6 0.0–5.0% Passing No. 16
Aluminum Oxide Content	ASTM C25	87% min

\* As an option, and with approval of the Engineer, the current edition of a corresponding AASHTO test may also be used in lieu of any ASTM test.

**406.2.1-Quality Control Testing:** Quality control is the responsibility of the Contractor as specified in 106.1.

The Contractor shall design a quality control plan in accordance with applicable section of MP307.00.50, excluding attachment 1, detailing the methods by which the quality control program will be conducted. Samples shall be obtained at a minimum frequency of one sample per day of aggregate placement.

**406.3-ACCEPTANCE TESTING:**

The material shall be evaluated by AASHTO Product Evaluation and Audit Solutions.

Acceptance sampling and testing of aggregates is the responsibility of the Division, except for furnishing the necessary materials. Quality control sampling and testing performed by the Contractor may be used by the Division for Acceptance.

**406.3.1-Skid Testing:** Test Sections are defined as a continuous lane of pavement to which a layer of high friction surface treatment (HFST) has been applied. The Engineer will submit a “Pavement Testing Request” form to [DOHMCSnTRoadway@wv.gov](mailto:DOHMCSnTRoadway@wv.gov), within five (5) days after all lanes are continuously open to traffic. The Division or an independent testing firm at the discretion of the Division, will perform initial skid testing within ninety (90) days after receiving the request. Skid testing will be performed with the ribbed tire as prescribed in AASHTO T242, *Frictional Properties of Paved Surfaces Using a Full-Scale Tire*. The frequency of tests shall be five (5) per lane-mile or three (3) per lane, whichever is greater. An average Friction Number (FN) of less than 69 will be deemed unacceptable and will require reinstallation of the complete surface system of the failed test section at no cost to the Division.

~~The Engineer will submit a second “Pavement Testing Request” form six (6) to nine (9) months after completion. The Division or independent testing firm will perform final skid testing no more than twelve (12) months after project completion. An average FN of less than 64 will be deemed unacceptable and will require reinstallation of the complete system of the failed test section at no cost to the Division.~~

**406.3.2-Acceptance for the Grading of Aggregate:** Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally, at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A subplot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this subplot shall be considered the lot. The material shall be sampled and tested in accordance with the applicable specification. The gradation test results shall be plotted on a control chart in accordance with MP 300.00.51. When the average, or when the most recent three consecutive individual test values fall outside the guidelines for this aggregate the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last subplot shall have its price adjusted in accordance with Table 406.12.1. In the case where the average is nonconforming and the last subplot contained is conforming, then there would be no price adjustment. In no event, however, shall a subplot of material have its price adjusted more than once, and the first adjustment, which is determined, shall apply.

**406.3.2.1-Degree of Nonconformance:** When a subplot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming and this value shall be multiplied by its appropriate multiplication factor as set forth in Table 406.3.2.1 to determine the degree of nonconformance on that sieve.

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**TABLE 406.3.2.1**

<b>Nonconforming Sieve Size</b>	<b>Multiplication Factor</b>
No. 6 (3.35mm)	1.5
No. 16 (1.18mm)	2.0

The total measure of nonconformance of an individual subplot is the sum of all nonconformances on the various sieve sizes of that subplot. When the total degree of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in Table 406.11.1. When the degree of nonconformance is greater than 12.0, the nonconforming subplot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed.

**CONSTRUCTION METHODS**

**406.4-WEATHER RESTRICTIONS:**

The polymer binder material shall not be placed on a wet surface, when the ambient air or surface temperature is either \*below 50 degrees Fahrenheit or ambient temperature above 110 degrees Fahrenheit, or when the anticipated weather conditions or pavement surface temperature would prevent proper application of the surface treatment as determined by the Engineer in consultation with the manufacturer’s representative.

\*Applications below 50 degrees Fahrenheit will be considered acceptable if the manufacturer can demonstrate a cure rate (dry through time) of <3 hours at current field conditions.

Do not place the HFST with visible moisture on the prepared surface at the time of placing. Test for moisture in the pavement by taping an 18”x18” plastic sheet to the pavement per ASTM D4263. Perform the plastic sheet test only when surface temperatures and ambient conditions are within the established parameters for application of the overlay system. In the event of rain, the pavement must be allowed to air dry prior to performing the plastic sheet test. A 2 hour minimum test duration is allowed in lieu of the 16 hours specified in ASTM D4263.

**406.5-PLACING:**

The Contractor shall ensure that a manufacturer’s representative is on site to provide technical assistance during the startup operations and as necessary during the surface preparation, material placement and during any necessary remedial work.

The Contractor shall cover and protect all existing pavement markings and utilities that are left in place prior to placement. All inadequately sealed joints and cracks greater than ¼” shall be cleaned and filled with a crack sealant approved by the polymer resin manufacturer.

For applications on new asphalt pavements, install the polymer binder and high friction aggregate topping a minimum of 30 days after placement of the new pavement.

Surfaces shall be clean, dry, and free of all dust, oil, debris and any other material that might interfere with the bond between the polymer resin binder material and existing surfaces. Adequate cleaning of all surfaces will be determined by the manufacturer’s representative. Utilities, drainage structures, curbs and any other structure within or adjacent to the treatment location shall be protected from the application of the surface treatment materials. Cover and protect all existing pavement markings that are adjacent to the application as directed by the Engineer. Pavement markings that conflict with the surface application shall be removed by

grinding and the surface shall be swept clean prior to the polymer binder application.

Clean concrete pavement surfaces by shot blasting and vacuum sweeping. Shot blast all surfaces to remove all curing compounds, loosely bonded mortar, surface carbonation, and deleterious material. Ensure that the prepared surface complies with the International Concrete Repair Institute (ICRI) standard for surface roughness CSP 5. After shot blasting, vacuum sweep or air wash, with a minimum of 180cfm of clean and dry compressed air, all surfaces to remove all dust, debris, and deleterious material. Maintain air lance perpendicular to the surface and the tip of the air lance within 12 inches of the surface.

Utilities, drainage structures, curbs, and any other structures within or adjacent to the treatment location must be protected against the application of the HFST materials.

When magnesium phosphate concrete is placed prior to the HFST bridge deck overlay, the magnesium phosphate concrete must be placed at least 72 hours prior to placing the polymer resin binder.

When modified high alumina based concrete is placed prior to the HFST bridge deck overlay, the polymer resin binder must not be placed on the concrete until at least 30 minutes after final set of the modified high alumina based concrete.

Expansion joints and deck drains must be adequately isolated prior to applying HSFT.

All debris, excess aggregate, material containers, and other waste shall be disposed of off the Right-of-Way according to Section 207 by the Contractor at no direct cost to the Department.

Any roadway features disturbed by the work of the Contractor's operations shall be restored in kind by the Contractor and approved by the Engineer at no cost to the Department.

**406.5.1-Mixing and Application:** The HFST must conform to the following:

1. Surface preparation work, surface temperature, placement of the HFST must be in conformance with the binder supplier's specifications, these special provisions and as approved by the Engineer.
2. The spread rate range for polymer resin binder shall be 3-3.5 sq yd./gal.
3. The spread rate range of retained aggregate shall be 13-20 lb/sq yd.
4. HSFT must be allowed to cure for the minimum duration as recommended by the supplier's specifications and during that time the application area must be closed to all traffic including Contractor's equipment.

**Mechanical Application:**

The applicator equipment must be capable of placing the resin binder and high friction aggregate, at the spread rates limits defined above, in a single pass. It shall provide adequate capacity of aggregate and resin binder capable of placing 1,500 lineal feet of HFST.

The polymer binder shall be blended and mixed in the ratio per the manufacturer's specification (+/- 2% by volume); the polymer binder shall be continuously applied once blended.

The mechanical aggregate spreader shall be capable of applying up to a continuous 12 foot width application. The high friction aggregate shall begin within 20 seconds (+/- 1 sec) of the base polymer binder application onto the pavement section. Complete coverage of aggregate shall be completed within 60 seconds of the resin binder contacting the pavement. No exposed wet spots of the polymer binder shall be visible once the aggregate is installed.

The operations shall proceed in such a manner that will not allow the mixed material to separate, cure, dry, be exposed or otherwise harden in such a way as to impair retention and

bonding of the high friction surfacing aggregate, walking, standing or any form of contact or contamination with the wet uncured resin will result in that section of resin being removed and replaced at the contractor's expense.

**Hand Application:**

Hand application acceptable only for areas deemed to be low volume and less than 300 feet in length, unless otherwise noted in the plans. The resin binder and aggregate shall be placed at the application limits defined above.

The resin binder shall be mixed in accordance to the manufacturer's recommendations and uniformly spread over the surface. The high friction aggregates shall be completed within 60 seconds of the resin binder contacting the pavement. No exposed wet spots of the polymer binder shall be visible once the aggregate is installed.

**406.6-CLEANING AND SWEEPING & RECOVERED AGGREGATE:**

Excess and loose aggregate must be removed from the traveled way and shoulders by street sweeping. Application of HFST requires a second street sweeping 24-48 hours after application. All cost for street sweeping shall be included in HFST pay item.

The excess aggregate may be recovered and reused. The excess aggregate shall be recovered by a mechanical sweeper and shall be clean, dry and uncontaminated. Aggregate shall not be recovered from areas that were not previously cleaned.

The recovered aggregate may be used at a rate no higher than 1 part recovered aggregate to 2 parts virgin aggregate. The recovered aggregate and virgin aggregate shall be a homogeneous blend and is subject to sampling and testing for gradation.

**406.7-ENVIRONMENTAL REGULATIONS:**

All regulations of the State of West Virginia shall be met involving the storage, application, and disposal of all materials on the project.

**406.8-JOINTS:**

The longitudinal construction joints between adjacent lanes shall be kept clean of material foreign to the type of surface being treated. The joints shall be constructed without overlaps or gaps between the materials.

The transverse joint at the end of successive sections or lanes shall be adequately protected to prevent overlapping of the binder material. Following its use, the materials shall be removed and disposed of satisfactorily.

**406.9-PROTECTION OF PAVEMENT AND TRAFFIC CONTROL:**

The Contractor shall be responsible for the protection of the surface against damage by their equipment and personnel. Traffic shall not be permitted on any part of the work under construction until the treatment has cured sufficiently to prevent raveling or pickup under traffic. The applicable provisions of 636 shall apply for regulating traffic.

**406.10-METHOD OF MEASUREMENT:**

No materials shall be removed from the Project for any purpose until the operation has been completed and the quantities of materials incorporated into the operations have been determined, except when authorized by the Engineer.

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The Quantity of “High Friction Surface Treatment”, when specified to be paid by the square yard, shall be measured by the total area the surface treatment is applied measured in place and accepted.

When items for maintaining traffic are included in the Contract, they will be measured and paid as provided in Section 636.

**406.11-BASIS OF PAYMENT:**

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing all the materials and doing all the work described above in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

The Quantity of “High Friction Surface Treatment” when specified to be paid by the square yard shall include the cleaning and sweeping, binder material, aggregate and all labor and equipment required to perform the operation.

**406.11.1-Price Adjustment:** Aggregates not conforming with the requirements of gradation as described in Table 406.2B-Aggregate, will be paid for at the adjusted contract price based on the degree of nonconformance as specified in Table 406.11.1.

**TABLE 406.11.1**

<b>Adjustment of Contract Price for Gradation Not Within Specifications</b>	
<b>Degree of Nonconformance</b>	<b>Percent of Contract Price To Be Reduced</b>
1.1 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12	*

\* The Division will make a special evaluation of the material and determine the appropriate action.

**406.12-PAY ITEMS:**

<b>ITEM</b>	<b>DESCRIPTION</b>	<b>UNIT</b>
406001-*	High Friction Surface Treatment	Square Yard

\* Sequence Number

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 606  
UNDERDRAINS**

**606.2-MATERIALS:**

DELETE MISCELLANEOUS CONCRETE FROM THE TABLE:

<b>MATERIAL</b>	<b>SUBSECTION</b>	<b>TYPE OR GRADATION</b>
Concrete for Miscellaneous Uses	715.12	
<del>Miscellaneous Concrete</del>	<del>715.12</del>	

DRAFT

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 607  
GUARDRAIL**

**607.2-MATERIALS:**

DELETE CONCRETE FOR FOOTERS FROM THE TABLE AND DELETE MISCELLANEOUS CONCRETE AND REPLACE WITH THE FOLLOWING:

MATERIAL	SUBSECTION
<del>Concrete for Footers</del>	<del>715.12</del>
<del>Miscellaneous</del> Concrete <u>for Miscellaneous Uses</u>	715.12



**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

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**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 636  
MAINTAINING TRAFFIC**

**636.24-BASIS OF PAYMENT:**

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The quantities, determined as provided above, will be paid for at the contract unit price bid for the items listed below, which prices and payment shall be full compensation for furnishing all the materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies and incidentals necessary to complete the work. When aggregate for maintaining traffic, dust palliatives, flagger, traffic director, pilot truck, cleaning of traffic control devices, or the electric arrow are contained in the contract as pay items, payment for such pay items ~~will not be made subsequent to the date of required completion of the project. shall~~ not exceed the plan quantity for use after the contract completion date.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

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SUPPLEMENTAL SPECIFICATION

FOR

SECTION 636  
MAINTAINING TRAFFIC

**636.19-PORTABLE MESSAGE SIGNS:**

ADD THE FOLLOWING SUBSECTION:

**636.19.3.3-Digital Speed Limit Sign:** A Digital Speed Limit (DSL) Sign shall conform to the general requirements of 636.19. DSL shall only be used for work zones for High-Speed (>55 mph) Multi-Lane Highways. The exact placement and any relocations of a DSL will be as directed by the Engineer.

Unless otherwise directed by the Engineer, the work zone speed limit referenced in the plans, shall be displayed on the DSL when workers are present. However, when workers are not present in the work zone, the design speed shall be based on the original posted speed limit or the warranted speed limit reduction for when workers are not present. The digital display legends and Speed Limit Sign Beacons on the DSL Sign Assemblies shall not be automatically changed/activated/deactivated using a pre-programmed schedule.

The Speed Limit Sign Beacons shall be in the alternating flashing mode (Activated) only when workers are present within the warranted work zone condition. All other times, the Speed Limit Sign Beacons shall not be flashing (Deactivated). Activate the Speed Limit Sign Beacons no earlier than 30 minutes before workers arrive in the warranted work zone condition and deactivate no later than 30 minutes after workers depart the warranted work zone condition. Change the digital display legend on the DSL Sign Assembly to the warranted speed limit no earlier than 30 minutes before workers arrive and no later than 30 minutes after workers depart from a warranted work zone condition. From the time of initial installation through the final removal, all activations and deactivations of the Speed Limit Sign Beacons, as well as all changes in the speed limit on the digital display legends of each DSL Sign Assembly, shall be logged at the time of occurrence. At any time, all or part of the logged time of occurrence may be requested by the Engineer or local law enforcement. Upon request, provide the log time of occurrence information to the Engineer within 1 working day.

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**636.23-METHOD OF MEASUREMENT:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

~~**636.23.22-Portable Message Sign:** The quantity of “Changeable Message Sign” and “Speed Motoring Trailer” shall be the actual number of days that the sign is used on the project.~~

**636.23.22-Portable Message Signs:**

**636.23.22.1- Changeable Message Sign:** The quantity of “Changeable Message Sign” shall be the actual number of days that the sign is used on the project.

**636.23.22.2- Speed Motoring Trailer:** The quantity of “Speed Motoring Trailer” shall be the actual number of days that the sign is used on the project.

**636.23.22.3- Digital Speed Limit Sign:** The quantity of “Digital Speed Limit Sign” shall be the actual number of days that the sign is used on the project.

**636.25-PAY ITEMS:**

ADD THE ITEM TO THE TABLE:

ITEM	DESCRIPTION	UNIT
<u>636031-*</u>	<u>Digital Speed Limit Sign</u>	<u>Day</u>

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

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**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 709**

**METALS**

**709.46-STEEL POSTS, POST BRACES AND GATE FRAMES FOR RIGHT-OF-WAY FENCE:**

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

Studded tee post producers to be considered for inclusion on the studded tee post producers Approved Product List (APL) must follow the procedures specified in MP 709.46.50.

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**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 101**

**DEFINITION OF TERMS**

**101.1-ABBREVIATIONS:**

DELETE NTPEP FROM THE SUBSECTION:

~~NTPEP — National Transportation Product Evaluation Program~~

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 401**

**ASPHALT BASE, WEARING, AND  
PATCHING AND LEVELING COURSES**

**401.9-EQUIPMENT:**

**401.9.7-Trucks for Transporting Mixture:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The inside surfaces of trucks shall be thinly coated with a ~~National Transportation~~ AASHTO Product Evaluation ~~Program (NTPEP) approved and Audit Solutions evaluated~~ asphalt release agent. The use of diesel fuel, kerosene, or similar solvent-based products which can dissolve the asphalt film from the aggregate particles will not be permitted. Any commercial release agent which can be certified by ~~NTPEP~~ AASHTO Product Evaluation and Audit Solutions as harmless to the mix may be used; however, the Division reserves the right to restrict any release agent that is shown to cause problems during placement of the mix. In the case of mixtures composed of PG Binders which contain polymer modification, truck surfaces should be coated with a release agent recommended by the binder supplier. All excess coating material shall be removed from the truck bed prior to loading the asphalt.

**DRAFT**

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**SUPPLEMENTAL SPECIFICATION**  
**FOR**  
**SECTION 707**  
**CONCRETE ADMIXTURES, CURING AND COATING MATERIALS**

**707.1-AIR ENTRAINING ADMIXTURES FOR CONCRETE:**

**707.1.1-Acceptance Requirements for Air Entraining Admixtures:**

**707.1.1.1-**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

In the event that the Contractor elects to use an air-entraining admixture, evidence based on testing by ~~NTPEP (National Transportation Product Evaluation Program)~~ AASHTO Product Evaluation and Audit Solutions shall be submitted to the Division to show that the material conforms to the requirements of AASHTO M 154. Tests for bleeding, bond strength and volume change will not be required unless specifically called for in the Plans.

**707.2-WATER-REDUCING AND RETARDING ADMIXTURES FOR CONCRETE:**

**707.2.1-Acceptance Requirements for Approval of Retarders:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Water reducing and retarding admixtures for concrete shall be tested by ~~NTPEP (National Transportation Product Evaluation Program)~~ AASHTO Product Evaluation and Audit Solutions. The ~~NTPEP testing test~~ results shall meet the requirements of AASHTO M 194, Type D or Type G.

**707.3-WATER-REDUCING ADMIXTURES FOR CONCRETE:**

**707.3.1-Acceptance Requirements for Approval of Water Reducers:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Water-reducing admixtures for concrete shall be tested by ~~NTPEP (National Transportation Product Evaluation Program)~~ AASHTO Product Evaluation and Audit Solutions. The ~~NTPEP testing test~~ results shall meet the requirements of AASHTO M 194, Type A or Type F.

#### **707.9-LIQUID MEMBRANE-FORMING COMPOUNDS FOR CURING CONCRETE:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Curing compounds shall conform to the requirements of ASTM C309, Type 2, Class A-  
~~All curing compound and~~ must be tested by ~~NTPEP AASHTO Product Evaluation and Audit Solutions~~ and shown to meet the specification listed in the paragraph above.

#### **707.13-ACCELERATING ADMIXTURES FOR CONCRETE:**

##### **707.13.1-Acceptance Requirements for Approval of Accelerators:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Accelerating admixtures for concrete shall be non-chloride and shall be tested by ~~NTPEP (National Transportation Product Evaluation Program)~~ AASHTO Product Evaluation and Audit Solutions. The ~~NTPEP testing test~~ results shall meet the requirements of AASHTO M 194, Type C.

#### **707.14-WATER-REDUCING AND ACCELERATING ADMIXTURES FOR CONCRETE:**

##### **707.14.1-Acceptance Requirements for Approval of Water-Reducing and Accelerating Admixtures:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Water-reducing and accelerating admixtures for concrete shall be tested by ~~NTPEP (National Transportation Product Evaluation Program)~~ AASHTO Product Evaluation and Audit Solutions. The ~~NTPEP testing test~~ results shall meet the requirements of AASHTO M 194, Type E.

#### **707.15-HYDRATION CONTROL STABILIZING ADMIXTURES FOR CONCRETE:**

##### **707.15.1-Acceptance Requirements for Approval of Hydration Control Stabilizing Admixtures:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE



FOLLOWING:

Water-reducing and accelerating admixtures for concrete shall be tested by ~~NTPEP (National Transportation Product Evaluation Program)~~ AASHTO Product Evaluation and Audit Solutions. The ~~NTPEP testing test~~ results shall meet the requirements of AASHTO M 194, Type B or D.

**707.17- SPECIFIC PERFORMANCE ADMIXTURES FOR CONCRETE:**

**707.17.1-Acceptance Requirements for Approval of Specific Performance Admixtures:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Specific performance admixtures for concrete shall be tested by ~~NTPEP (National Transportation Product Evaluation Program)~~ AASHTO Product Evaluation and Audit Solutions. The ~~NTPEP testing test~~ results shall meet the requirements of AASHTO M 194, Type S.

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**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 708  
JOINT MATERIALS**

**708.3-JOINT AND CRACK SEALANT, HOT-POURED FOR CONCRETE AND ASPHALT PAVEMENTS:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

This material shall meet the requirements of ASTM D6690, and shall be evaluated by AASHTO ~~National Transportation~~ Product Evaluation and Audit Solutions Program (NTPEP). Unless otherwise specified, Type II sealant shall be used.

**708.4-SILICONE JOINT SEALANT; JOINT BACK-UP MATERIAL:**

**708.4.1-Silicone Joint Sealant:**

**708.4.1.2-Test Requirements:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN SUBSECTION AND REPLACE WITH THE FOLLOWING:

The sealant shall meet the following requirements, and shall be evaluated by AASHTO ~~National Transportation~~ Product Evaluation and Audit Solutions Program (NTPEP).

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

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**FOR**

**SECTION 709**

**METALS**

**709.1-STEEL BARS FOR CONCRETE REINFORCEMENT:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

All plain and deformed bar reinforcement shall meet the requirements of AASHTO M31. The manufacturer shall also be an active member in the ~~National Transportation Product Evaluation Program (NTPEP)~~ AASHTO Product Evaluation and Audit Solutions as well as conform to the requirements of MP 709.01.55.

**709.1.2-High Chromium Steel Bars for Concrete Reinforcement:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

For corrosion resistant high chromium steel, the material shall meet testing requirements of tensile, yield, elongation, and bend requirements listed in ASTM A1035 and meet requirements set forth in MP 709.01.50 unless otherwise stated in the project plans.

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**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**  
**DIVISION OF HIGHWAYS**  
**SUPPLEMENTAL SPECIFICATION**  
**FOR**  
**SECTION 711**  
**PROTECTIVE COATINGS, STAINS, AND TRAFFIC PAINTS**

**711.5-CONCRETE PROTECTIVE COATINGS AND STAIN:**

**711.5.3-Approval:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

For approval of concrete coatings, the manufacturer shall submit copies of certified test reports to the Materials Control, Soils and Testing (MCS&T) Division for review and approval. An independent testing laboratory acceptable to the Division shall perform the tests described herein on representative samples of the material. Tests listed herein are the minimum testing requirements to be met. Attach copies of test procedures which differ from those stated herein. In addition, provide brochures or booklets containing detailed instructions and explanatory remarks about surface preparation, application procedures, and operations. The Division may also choose materials tested by the ~~National Transportation Product Evaluation Program (NTPEP)~~ AASHTO Product Evaluation and Audit Solutions and/or the North East Protective Coating Committee (NEPCOAT) to be placed on the approved source list.

**711.23-MATERIAL/SYSTEM APPROVAL:**

**711.23.1-**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The Division will develop an approved list of products meeting this specification. This list will be placed on the Division's website. The list may be based upon previous testing performed by the Division, or the Division may choose materials from the ~~National Transportation Product Evaluation Program (NTPEP)~~ AASHTO Product Evaluation and Audit Solutions and/or the North East Protective Coating Committee (NEPCOAT) tested materials. Upon approval by the Division, further testing may not be required. The Division may request random samples to assure compliance with specification requirements.

Any materials not previously tested by MCS&T Division, ~~NTPEP~~ AASHTO Product

Evaluation and Audit Solutions, or NEPCOAT shall be submitted for evaluation and approval testing. Paints and coatings submitted for approval testing shall be furnished to the MCS&T Division in appropriate containers not holding more than one gallon of material. Each component shall be labeled appropriately, and the following information shall be provided with the sample:

- i. Name and address of Manufacturer
- ii. Trade Name or Trade Mark
- iii. Type of Paint
- iv. Lot or Batch number
- v. Date of manufacturing
- vi. All SDS/PDS information pertaining to the material
- vii. Reference to the Division's Standard Specifications
- viii. One (1) one-gallon kit of product/thinner

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

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**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 715  
MISCELLANEOUS MATERIALS**

**715.4-CONCRETE REPAIR MATERIALS:**

**715.4.1-Cementitious and Polymer-Modified Materials for Concrete Repairs:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Material to be used in concrete repair applications shall be tested through AASHTO's ~~National Transportation Product Evaluation and Audit Solutions Program (NTPEP)~~ and meet the requirements in Table 715.4.1. In addition, they must remain current with ~~NTPEP's the AASHTO Product Evaluation and Audit Solutions~~ policy regarding periodic re-testing as required by the program. Product submittals shall include: a completed Form HL-468 (available on the WVDOH Materials Division Web Page), a copy of the technical data sheet, the current Material Safety Data Sheet (MSDS), and the results of ~~NTPEP AASHTO Product Evaluation and Audit Solutions~~ testing. Any incomplete submittals will not be evaluated for inclusion on WVDOH approved list of concrete patching Materials.

**715.4.2-Polymer Concrete Materials for Concrete Repairs:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

A Polymer Product is a composite material formed by polymerization of a monomer and an aggregate mixture, in which the polymerized monomer acts as the sole binder for the aggregate. Polymer concrete uses a polymer binder in place of Portland cement. These materials are required to be tested through AASHTO's ~~National Transportation Product Evaluation and Audit Solutions Program (NTPEP)~~ and meet the requirements in Table 715.4.2. In addition, they must remain current with ~~NTPEP's AASHTO Product Evaluation and Audit Solutions~~ policy regarding periodic re-testing as required by the program. Product submittals shall include: a completed Form HL-468 (available on the WVDOH Materials Division Web Page), a copy of the technical data sheet, the current Material Safety Data Sheet (MSDS), and the results of ~~NTPEP AASHTO Product Evaluation and Audit Solutions~~ testing. Any incomplete submittals will not be evaluated for inclusion on WVDOH approved list of

patching Materials.

## **715.9-WARNING DEVICES:**

### **715.9.2-Signs:**

DELETE THE CONTENTS OF THE SECOND PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

All references herein to ASTM specification D4956 shall be interpreted as referencing version D4956–11a. Any portion of this specification which is in contradiction to ASTM D4956 shall supersede ASTM D4956. All references herein to AASHTO specification M268 shall be interpreted as referencing version M 268-10. Any portion of this specification which is in contradiction to AASHTO M 268 shall supersede AASHTO M 268. ~~All AASHTO NTPEP references herein shall be interpreted as referring to the AASHTO National Transportation Product Evaluation Program (NTPEP).~~ All retroreflectivity values referenced herein shall be in units of cd/fc/ft<sup>2</sup>. All “matched component” references herein shall be interpreted as referencing the retroreflective sheeting manufacturer’s recommended inks and overlay films to be used for manufacturing purposes with the manufacturer’s sheeting. All APL references herein shall be interpreted as referring to the Division’s Approved Products List (APL) for Retroreflective Sheeting. All CSS references herein shall be interpreted as referring to the Division’s Central Sign Shop (CSS) internal sign manufacturing facility in Charleston, WV.

### **715.9.2.9-Approval Processes:**

#### **715.9.2.9.1-Retroreflective Sheeting Materials & Matched Components**

##### **715.9.2.9.1.1-Independent Test Results:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

In order for the material to be evaluated and considered for approval, independent test results must be supplied by the manufacturer demonstrating the sheeting material’s conformance with the requirements specified within the applicable Section 715.9.2.1, 715.9.2.2, 715.9.2.3, or 715.9.2.4, with the exception of the requirements specified in the “Shelf Life”, “Backing Class”, and “Durability” subsections. The independent test results shall include accelerated outdoor weathering test results conducted in conformance with ASTM D4956. Artificial accelerated lab weathering shall not be accepted except for materials intended for work zone applications. Materials intended for work zone applications shall include all Type ASTM-VI materials and shall include, but may not be limited to, other “Type” materials intended for use on plastic posts, tubes, barricades, drums, cones, and channelizer cones, including “permanently” installed plastic posts and tubes. However, any approval granted based on the results of artificial accelerated lab weathering shall be provisional in nature and noted as such on the APL. As a condition of the acceptance of artificial accelerated lab weathering results in lieu of accelerated outdoor weathering results, the accelerated outdoor weathering process shall be ongoing at the time of issuance of the provisional approval. In addition, the material manufacturer shall submit

the standard outdoor weathering test results to the WVDOH within nine (9) months after the effective date of the provisional approval for Type 852 ASTM- VI materials, and within fifteen (15) months after the effective date of the provisional approval for all other material “Types”. AASHTO Product Evaluation and Audit Solutions-NTPEP results shall be considered acceptable for meeting the accelerated outdoor weathering test results requirement.

### **715.9.3-Channelizing Devices:**

DELETE THE CONTENTS OF THE SECOND PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Devices which are included as part of the AASHTO ~~National Transportation~~ Product Evaluation and Audit Solutions-Program (AASHTO-NTPEP), and for which an APL is maintained, shall be tested as part of the AASHTO Product Evaluation and Audit Solutions-NTPEP in order to be considered for approval.

### **715.9.3.9-Product Submission and Approval:**

DELETE THE CONTENTS OF THE SECOND PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The manufacturer should include all relevant documentation and information, including but not limited to product data sheets, product flyers, manufacturer product specifications and recommendations, product bulletins, engineering drawings, AASHTO Product Evaluation and Audit Solutions-NTPEP test results, and crash testing performance documentation.

## **715.11-ENGINEERING FABRIC:**

### **715.11.2-Acceptance:**

DELETE THE CONTENTS OF THE FIRST PARAGRAPH IN THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

All engineering fabric shall be approved before use. ~~NTPEP-AASHTO Product Evaluation and Audit Solutions~~ test data shall be furnished for the engineering fabric to be approved. The test data must be for the current 3-year cycle for the manufacturer or private labeler providing the material. The engineering fabric shall have a manufacture date within the current three-year-~~NTPEP AASHTO Product Evaluation and Audit Solutions~~ evaluation cycle of the manufacturer’s, or private labeler’s facility providing the material. The manufacturer or private labeler must be listed as ~~NTPEP AASHTO Product Evaluation and Audit Solutions~~ compliant for the current calendar year or be listed as compliant for the previous calendar year and have an application for audit during the current year.



**715.14-ELASTOMERIC BEARING PADS:****715.14.2-Approval for Bearing Pads Without Shims:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

~~Beginning January 1, 2024 b~~Bearing pads that do not include shims or internal stiffeners will only be accepted using NTPEP AASHTO Product Evaluation and Audit Solutions test results and a certificate of compliance ~~from NTPEP~~.

~~Prior to January 1, 2024 the WVDOH will accept NTPEP test results and a certificate of compliance from NTPEP for approval of bearing pads without shims or internal stiffeners, or a company without NTPEP test results and a certificate of compliance from NTPEP can still submit bearing pads for acceptance testing using 715.14 and 715.14.1 until December 31, 2023.~~

**715.40-PAVEMENT MARKING MATERIAL:****715.40.2-Preformed Intersection Traffic Markings (Type V Material):****715.40.2.3-Approved Products Listing:**

DELETE THE FIRST PARAGRAPH OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Material approvals are based on results from AASHTO Product Evaluation and Audit Solutions's ~~NTPEP~~ testing program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved materials, code numbers, and approved Contractor personnel may be obtained by contacting:

**715.40.4-Temporary Pavement Marking Tape (Types VIIB and VIIC):****715.40.4.2-Temporary Pavement Markings (Type VIIB):****715.40.4.2.1-Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET xi OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

- xi. **Approved Products Listing (APL):** Approvals are based on results from AASHTO's Product Evaluation and Audit Solutions ~~NTPEP~~ testing program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved suppliers and their code numbers may be obtained by contacting:

**715.40.4-Temporary Pavement Marking Tape (Types VIIB and VIIC):****715.40.4.3-Temporary Pavement Markings (Type VIIC):****715.40.4.3.1-Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET xii OF THE SUBSECTION AND

REPLACE WITH THE FOLLOWING:

- xii. Approved Products Listing (APL): Approvals are based on results from AASHTO's ~~Product Evaluation and Audit Solutions-NTPEP~~ testing program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved suppliers and their code numbers may be obtained by contacting:

**715.40.6-Raised Pavement Markers (RPM's):**

**715.40.6.1-Type P-2 Markers:**

**715.40.6.1.1-Casting Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET j OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Castings shall have fully completed testing on the ~~American Association of State and Highway Transportation Officials National Transportation Product Evaluation Program (AASHTO NTPEP) AASHTO Product Evaluation and Audit Solutions~~ test deck in a location having a similar climate to West Virginia. Upon review, the performance of the castings on the test deck shall meet or exceed the historical performance of other industry standard castings approved by the WVDOH. This determination shall be made solely by the WVDOH.

**715.40.6-Raised Pavement Markers (RPM's):**

**715.40.6.1-Type P-2 Markers:**

**715.40.6.1.2-Lens Requirements:**

DELETE THE FIRST PARAGRAPH IN BULLET m OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Lenses shall have fully completed testing on the ~~American Association of State and Highway Transportation Officials National Transportation Product Evaluation Program (AASHTO NTPEP) AASHTO Product Evaluation and Audit Solutions~~ test deck in a location having a similar climate to West Virginia. Upon review, the performance of the lenses on the test deck shall meet or exceed the historical performance of other industry standard lenses approved by the WVDOH. This determination shall be made solely by the WVDOH.

**715.40.6-Raised Pavement Markers (RPM's):**

**715.40.6.1-Type P-2 Markers:**

**715.40.6.1.4-Product Submission and Approval:**

DELETE THE CONTENTS OF SUBSECTION AND REPLACE WITH THE FOLLOWING:

Type P-2 marker castings and/or lenses to be considered for inclusion on the WVDOH Approved Products List (APL) shall be submitted to the Materials Division following the

current procedures specified by the Materials Division. The manufacturer may contact the Traffic Engineering Division for verification. The manufacturer should include all relevant documentation and information with this form, including but not limited to Product Data Sheets, Product Flyers, Manufacturer Product Specifications, Product Bulletins, Engineering Drawings, AASHTO Product Evaluation and Audit Solutions -NTPEP test results, and the independent testing facility test results described herein.

In addition to the above, the WVDOH may also require that the casting and/or lens product(s) submitted for evaluation be field tested in one or more locations in West Virginia in order to validate the acceptable performance of the product(s). This field testing shall typically be a minimum of six months to one year in duration including a full winter season. Specific details related to this testing, such as locations and quantities, shall be determined by the WVDOH.

All submitted information will be forwarded to the WVDOH Traffic Engineering Division, which will in turn contact and work directly with the manufacturer during the evaluation process. The Traffic Engineering Division will evaluate all submitted literature and documentation for compliance with the specified requirements as well as satisfactory performance on the AASHTO Product Evaluation and Audit Solutions -NTPEP test deck. The Traffic Engineering Division may also arrange for the manufacturer to furnish test samples and arrange for the product to be installed for field testing as previously described. After the evaluation is complete, the Traffic Engineering Division will inform the Materials Division in writing of the outcome of its evaluation.

**715.40.6-Raised Pavement Markers (RPM's):**

**715.40.6.2-Type R-4 Markers:**

DELETE THE FIRST PARAGRAPH IN BULLET q OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

- q. The markers shall have fully completed testing on the ~~American Association of State and Highway Transportation Officials National Transportation Product Evaluation Program (AASHTO NTPEP)~~ AASHTO Product Evaluation and Audit Solutions test deck. Upon review, the performance of the markers on the test deck shall meet or exceed the historical performance of other industry standard Type R-4 markers approved by the WVDOH. This determination shall be made solely by the WVDOH.

**715.40.6-Raised Pavement Markers (RPM's):**

**715.40.6.2-Type R-4 Markers:**

**715.40.6.2.2-Product Submission and Approval:**

DELETE THE CONTENTS OF SUBSECTION AND REPLACE WITH THE FOLLOWING:

Type R-4 markers to be considered for inclusion on the WVDOH Approved Products List (APL) shall be submitted to the Materials Division following the current procedures specified by the Materials Division. The manufacturer may contact the Traffic Engineering Division for verification. The manufacturer should include all relevant documentation and

information with this form, including but not limited to Product Data Sheets, Product Flyers, Manufacturer Product Specifications, Product Bulletins, Engineering Drawings, AASHTO Product Evaluation and Audit Solutions ~~NTPEP~~ test results, and the independent testing facility test results described herein.

In addition to the above, the WVDOH may also require that the markers submitted for evaluation be field tested in one or more locations in West Virginia in order to validate the acceptable performance of the product(s). This field testing shall typically be a minimum of six months to one year in duration including a full winter season. Specific details related to this testing, such as locations and quantities, shall be determined by the WVDOH.

All submitted information will be forwarded to the WVDOH Traffic Engineering Division, which will in turn contact and work directly with the manufacturer during the evaluation process. The Traffic Engineering Division will evaluate all submitted literature and documentation for compliance with the specified requirements as well as satisfactory performance on the AASHTO Product Evaluation and Audit Solutions ~~NTPEP~~ test deck. The Traffic Engineering Division may also arrange for the manufacturer to furnish test samples and arrange for the product to be installed for field testing as previously described. After the evaluation is complete, the Traffic Engineering Division will inform the Materials Division in writing of the outcome of its evaluation.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 101**

**DEFINITION OF TERMS**

**101.2-DEFINITIONS:**

DELETE AND REPLACE THE DEFINITION OF ENGINEER IN THE SUBSECTION WITH THE FOLLOWING:

**Engineer**-The ~~State Highway Engineer~~ Deputy Commissioner of Highways of the Division, or an authorized representative, limited by the scope of duties assigned.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION****DIVISION OF HIGHWAYS****SUPPLEMENTAL SPECIFICATION****FOR****SECTION 106  
CONTROL OF MATERIALS****106.3-SAMPLES:**

ADD THE FOLLOWING CONTENTS TO THE SECTION:

All materials will be inspected, tested and approved prior to incorporation into the work. Any work which incorporates materials prior to the above evaluation shall be performed at the Contractor's risk, and may subsequently be considered as unacceptable. Unless otherwise specified, the materials shall meet the applicable Standard or Interim Specifications of the American Association of State Highway and Transportation Officials (AASHTO), the Standard or Tentative Specifications of the American Society for Testing and Materials (ASTM), or Standards adopted by other specifying agencies, with preference given in the same order in which the above agencies are listed. The specification which is current at the time of advertisement for bids shall govern, except that, with the approval of the Engineer, subsequent revisions or adoptions may govern. All materials being used are subject to inspection, testing or rejection at any time prior to final acceptance of the completed work.

The Contractor shall be responsible for the quality of construction and materials incorporated. When called for in the Specifications and/or Materials Procedure, the Contractor shall perform all necessary process control inspection, sampling and testing. All materials will be approved for acceptance through the Division's acceptance procedures. The Division has the exclusive right and responsibility for determining the acceptability of the construction and materials incorporated. The Division may use the results of the Contractor's inspection, sampling and testing for acceptance purposes.

Tests shall not be considered complete until they are submitted by the Contractor to the Division. The submission of test results shall be provided in a timely manner as specified in MP 109.00.21. Failure to submit test results by the established guideline will result in a price penalty assessed based on MP 109.00.21.

The Contractor may submit for acceptance, materials that appear on the Division Approved Source/Product Listing (APL). These submissions shall include a clear and legible invoice from the manufacturer and contain the product's approved lab number. Products that are not on the approved product list may be used on projects as long as these products meet the requirements for that material. Prospective new products for the approved product list shall follow the guidelines of MP 106.00.02. and MP 106.00.03.

Lot or subplot sizes will normally be designated. In the event that operational conditions cause work to be interrupted, or only partially completed before the lot size designated has been achieved, the lot or subplot may be redefined by the Engineer as being either the amount of work accomplished within the day or that work partially completed combined with the next lot or subplot of work. It is the intent of these Specifications that the number of samples required to evaluate each lot or subplot will be unchanged even when the lot or subplot is redefined.

When an acceptance plan is cited, it shall be in accordance with 106.3.1.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 109**

**MEASUREMENT AND PAYMENT**

**109.20-WEIGH TICKETS:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The Allowable Gross Weight for any vehicle being used to haul materials on publicly maintained highways under the terms of this contract shall be as follows.

Title 23 Code of Federal Regulations, Section 658.17, establishes maximum allowable gross weight on the Interstate System. The maximum allowable gross weight on WV and US Routes will be as established in Chapter 17C, Articles 17 and 17A of the Official Code of West Virginia, as amended. The Public Service Commission, Weight Enforcement Section is responsible for the enforcement of these provisions.

A weigh ticket shall be required with each load of material from a commercial source which would normally have truck scales. This includes, but is not limited to, all asphalt paving materials and all aggregates regardless of the contract pay unit. The weigh ticket shall include gross, tare, and net weights, time and date of loading, Item Number and Description of Materials, Contract Number or Project Number, **Contract ID, Line number, Source (AWP Facility code)**, number of axles on haul unit, license number of haul unit, and signature of the weigher certifying that all information on the ticket is correct, **All asphalt will require the Target Density and Plant test lab numbers, All concrete items will require the concrete mix design, cement factor, and batch weights.** If the weigher's name is printed by the computer on the ticket, then it only needs to be initialed by the weigher.

For material from a commercial source or a batch plant, which would not normally have truck scales, a weigh ticket documenting the tare weight, number of axles on the haul unit, license number of haul unit, date weighed, location of scales, and signature of the weigher certifying that all information on the ticket is correct, may be supplied for each haul unit as an alternate to the ticket required in the previous paragraph. The tare weight ticket shall be supplied for each contract on a yearly basis and when modifications are made to the vehicle or combination of vehicles. The weight of the material delivered shall be calculated and furnished by the vendor/supplier shipping the material to the project site or DOH facility. This includes, but is not limited to, concrete, structural steel, piling, reinforcing steel and all prepackaged material of known weight, such as cement, grout, fertilizer, lime, abrasives, etc.



If the haul unit is a combination of vehicles, the license number shall be supplied for each component. The tare weight shall be for the complete haul unit.

All weighing shall be done on scales approved and sealed by the West Virginia Division of Labor, Bureau of Weights and Measures. If the scales are moved or upon the request of the Engineer, the scales shall be reapproved and sealed. The Engineer shall be notified of any scale malfunctions. The Division of Highways may, at its option, accept inspection and sealing by out of state agencies when the material is being loaded outside West Virginia.

Any material, covered by this provision, which is delivered without the proper weigh ticket shall not be accepted by the Division of Highways.

Nothing in this provision relieves any party from compliance with the State Law on load limits or any fines which may be assessed for violation of said law.

ADD THE FOLLOWING:

**109.20.1-Electronic Ticket Delivery:** In addition, for asphalt, aggregate, and concrete, electronic ticket delivery (e-tickets) shall be required with the standard information provided as on the paper ticket. The e-ticketing system must interface with the WVDOH e-ticketing portal and provide WVDOH field personnel the ability to access tickets from a smartphone, tablet, or laptop and to make notes associated with each ticket if needed. The service must also provide a daily summary report. A digital signature of the weigh person on an e-ticket or daily summary report shall be considered the equivalent as a hand-signed/initialed, printed ticket.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 402

ASPHALT SKID RESISTANT PAVEMENT

**402.2-MATERIALS:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

The coarse aggregate shall consist of gravel, slag, or other acceptable polish resistant aggregate, or combinations thereof, meeting the requirement of Subsections 703.1 through 703.3, ~~except as amended in this subsection.~~

When stone or gravel is specified in the contract, the coarse aggregate shall consist of gravel or other acceptable polish resistant aggregate, or combination thereof meeting the requirements of 703.1 through 703.3, ~~except as amended in this subsection.~~ When slag is specified in the contract, the coarse aggregate shall be slag which meets the requirements of 703.3, ~~except as amended in this subsection.~~

Acceptable dolomite may be used alone or as a part of a coarse aggregate blend on roadways with a projected ESAL value of less than 3,000,000. On roadways with a projected ESAL value of 3,000,000 or greater, acceptable dolomite may be used only as a part of the coarse aggregate blend and shall not exceed 50% of that blend.

~~The total of shale (determined by MP 703.00.27), coal and other lightweight deleterious material (determined by ASTM C123) and friable particles (determined by MP 703.01.20) shall not exceed three percent (3%).~~

## WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

## DIVISION OF HIGHWAYS

## SUPPLEMENTAL SPECIFICATION

## FOR

SECTION 601  
STRUCTURAL CONCRETE**601.3-PROPORTIONING:****601.3.2-Field Tolerances and Adjustments:****601.3.2.4-Total Solids  $\bar{A}$ :****601.3.2.4.1-Optimized Aggregate Gradation:**

DELETE THE TABLE AND 601.3.2.41B AND REPLACE WITH THE FOLLOWING:

**Table 601.3.2.4.1B**

<b>Sieve Size</b>	<b>Allowable variation from Combined % Retained in Design Mix <sup>Note 1</sup></b>
1 in	$\pm 10\%$ of the % retained on this sieve in the Design Mix
$\frac{3}{4}$ in	$\pm 10\%$ of the % retained on this sieve in the Design Mix
$\frac{1}{2}$ in	$\pm 10\%$ of the % retained on this sieve in the Design Mix
$\frac{3}{8}$ in	$\pm 10\%$ of the % retained on this sieve in the Design Mix
No. 4	$\pm 5\%$ of the % retained on this sieve in the Design Mix
No. 8	$\pm 5\%$ of the % retained on this sieve in the Design Mix
No. 16	$\pm 4\%$ of the % retained on this sieve in the Design Mix
No. 30	$\pm 4\%$ of the % retained on this sieve in the Design Mix
No. 50	$\pm 4\%$ of the % retained on this sieve in the Design Mix
No. 100	$\pm 3\%$ of the % retained on this sieve in the Design Mix
No. 200	$\pm 32\%$ of the % retained on this sieve in the Design Mix

Note 1 The maximum and minimum allowable % retained on each sieve size noted in Table 601.3.2.4.1A shall not be exceeded during production. For example, if the  $\frac{1}{2}$ " sieve has a combined % retained of 15% in design mix, then the allowable % retained on  $\frac{1}{2}$ " sieve during production would be 5% to 20%.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION****DIVISION OF HIGHWAYS****SUPPLEMENTAL SPECIFICATION****FOR****SECTION 625****ROCK SOCKETED DRILLED SHAFT**

DELETE THE CONTENTS OF THE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

**625.1-DESCRIPTION:**

The work of this section includes the furnishing of all materials and the construction of rock socketed drilled shaft foundations consisting of reinforced concrete placed within the drilled excavations. Each rock socketed drilled shaft foundation shall consist of an upper drilled shaft portion in a steel casing and a lower rock socket portion.

**625.2-SUBMITTALS:**

The Contractor shall deliver all submittals required by this specification to the Engineer no later than one month prior to constructing any rock socketed drilled shafts ~~shown in the plans~~. No rock socketed drilled shafts shall be constructed prior to the Engineer's review and acceptance of all submittals.

**625.2.1-Experience:**

- ~~A satisfactory record of experience in rock socketed drilled shaft construction is of the utmost importance in obtaining a satisfactory rock socketed drilled shaft installation.~~ The installation of ~~the~~ drilled shafts is required to be performed by a Contractor, ~~or specialty subcontractor specializing in installing and~~ having experience with rock socketed drilled shafts of similar length, diameter, and subsurface conditions as those shown in the contract documents. In addition, the Contractor's on-site supervisor shall have experience with rock socketed drilled shafts of similar length, diameter, and subsurface conditions.
- The Contractor shall submit data on at least two projects performed during the past ten years, ~~for which the Contractor, or Contractor's key personnel who will be the on-site supervisor, have installed rock socketed drilled shafts of a range of diameters and lengths similar to those shown in the plans, in similar quantities, and under similar subsurface conditions.~~ The list of projects shall contain names and phone numbers of owners' representatives who can verify the participation in those projects.
- The Engineer shall review and approve the Contractor's ~~(Subcontractor's)~~ qualifications. If in the opinion of the Engineer the Contractor's qualifications are not adequate, the Contractor shall submit to the Engineer a proposed method of obtaining

the necessary qualifications.

4. The installation of all components of the drilled shaft ~~including; drilling, reinforcement placement, concrete placement, and required wet hole condition work, casing installation and removal, slurry placement,~~ and any other work required to complete the rock socketed drilled shaft, shall be performed by the approved Contractor ~~or specialty subcontractor.~~

~~**625.2.2-Site Inspection:** A signed statement shall be submitted affirming that the Contractor (or the Subcontractor if applicable) has inspected the project site and the available subsurface information including any available soil or rock samples. Blank.~~

~~**625.2.3-Installation:** The Contractor shall comply with applicable environmental regulations, including but not limited to the protection of river/stream water from degradation due to material excavated, ~~from rock socketed drilled shaft locations or due to other harmful~~ erosion, ~~protection of the environment from~~ slurry spillage/~~or discharge, if slurry is used, and general environmental protection of the area from~~ and all other operations related to rock socketed drilled shafts.~~

The installation shall be in accordance with the Contractor's proposed Safety Plan per Section 625.6.1.7.

The Contractor shall provide a projected schedule of work to the Technical Support Division, [DOHDrilledShafts@wv.gov](mailto:DOHDrilledShafts@wv.gov), thirty (30) days in advance of construction of drilled shafts. ~~This projected schedule will be used by the Technical Support Division to schedule preinstallation core hole drilling and drilled shaft inspection.~~

~~**625.2.4-As-Built Records:** Within 24 hours of the completed construction of each drilled shaft, the Contractor shall submit a report on the actual location, alignment, elevation, and dimensions of the drilled shaft, and ~~will also submit~~ a completed drilled shaft log to the Engineer.~~

**625.3:** Blank

#### **625.4-DIMENSIONAL REQUIREMENTS:**

If the specified dimensional requirements are not met, the Contractor shall submit a corrective plan for any deviation from the drilled shaft location, alignment and elevation tolerances, and reinforcement dimensional requirements to the Engineer for approval. This approval may take up to fourteen (14) calendar days. The corrective plan shall be certified (signed by a Professional Engineer licensed in West Virginia knowledgeable in rock socketed drilled shaft installation). The cost of any corrective action shall be borne by the Contractor.

#### **625.5-MATERIALS:**

~~**625.5.1-Concrete:** Concrete for the rock socketed drilled shafts shall be Class DC and shall conform to the requirements of Section 601.~~

The design 28-day compressive strength shall not be less than 4500 psi unless shown otherwise in the Plans. The Contractor shall prepare a mix design in accordance with MP 711.03.23 to attain this strength. Slump for dry placement shall be seven (7) inches plus-or-minus one (1) inch. Unless otherwise specified in the Plans, the cement shall be Type I.

For placement of concrete by tremie or pumping, the cement factor shall be increased by 94 lbs. from the original design cement factor, the slump shall be eight (8) inches plus-or-

minus one (1) inch and shall maintain a slump in excess of four (4) inches throughout the concrete placement.

**625.5.2-Reinforcing Steel:** Reinforcing steel for main vertical bars and ties shall conform to Section 709.1, deformed type, grade 60. Reinforcing steel for use as spirals shall conform to Section 709.1, plain type, grade 60.

**625.5.3-Casing:** Metal casing shall be used in the upper drilled shaft portion of the rock ~~socket~~ socketed drilled shaft to prevent caving of the soil material or to exclude ground water. Casing shall be metal, of unit or sectional construction, be strong enough to withstand handling stresses, withstand the pressures of concrete and of the surrounding earth and ground water, and prevent seepage of water. ~~Also, the~~ casing used shall be selected by the Contractor to control dimensions and alignment of excavations within tolerances, to seal the casing into impervious materials, and to execute all other construction operations.

Casing pipe used for permanent applications shall be new material and conform to ASTM A252, Grade 2. ~~Casing pipe, When used for temporary applications only, will initially be required to meet the requirements of permanent pipe but when removed can be transferred to the contractor's stock and reused on subsequent projects casing pipe shall conform to ASTM A252, Grade 2.~~

Any required casing splices shall be welded with no interior splice plates, producing true and straight casing. All welding shall be in accordance with ANSI/AWS D1.1.

Permanent casing is required in all drilled shafts where noted on the plans. All temporary casing shall be removed during placement of concrete unless otherwise noted on the plans. Should the Contractor be unable to remove the temporary casing or if conditions require the temporary casing remain in place, the Contractor shall pressure grout the annular space between the casing and soil. Materials and methods for grouting operation shall be submitted to the Engineer for approval for the grouting operation. There shall be no additional cost to the Division for the grouting operation.

**625.5.4-Crosshole Sonic Logging (CSL) Testing Tubes:** Tubes required for CSL Tests shall be ASTM A53, Grade B, nominal two (2) inch diameter. Hydrostatic test requirements are waived. Threaded Couplings shall be used per ASTM A865.

**625.5.5-Thermal Integrity Profiler (TIP) Wires:** Wire, equipment, and testing procedure shall conform to ASTM D7949, Method B.

## **625.6-CONSTRUCTION:**

The following sequence describes a generalized construction method that is expected to be appropriate for the installation of the rock socketed drilled shafts. Deviations will be permitted with the Engineer's approval.

- a. Contractor shall provide suitable access to the "Preinstallation Core Hole" location at each rock socketed drilled shaft.
- b. Drilling of a "Preinstallation Core Hole", ~~will be performed by the Division\*~~ as specified in subsection 625.7.2.1.
- c. Drilling of cased hole through the soil overburden down to top of competent rock. Seating bottom of casing to minimize entry of ground water.

- d. Drilling of rock socket to the minimum diameter shown in the plans and to an elevation shown on the drawings or otherwise directed by the Engineer.
- e. Determination of wet or dry hole condition, ~~by the Division\*~~, as specified in subsection 625.7.2.2.
- f. Inspection of drilled hole for plumbness, ~~by the Division\*~~, as specified in subsection 625.7.2.3.
- g. Cleaning of the drilled hole by the Contractor, particularly the rock socket and the inside face of the casing, as specified in subsection 625.7.2.5.
- h. Inspection of the drilled shaft sidewall and bottom cleanliness, ~~by the Division\*~~ as specified in subsections 625.7.2.4 and 625.7.2.5.
- i. Placement of the pre-assembled cage of reinforcing steel with CSL tubes and/or TIP wires and securing it in place against movement during concreting and during casing withdrawal, as specified in subsection 625.6.2. It also must be secured in such a way that the minimum clear cover over the bars is maintained.
- j. Placement of concrete in either dry or wet conditions. The temporary casing shall be withdrawn carefully and slowly so as not to leave any voids in the concrete and so as not to dislocate any reinforcing steel. Any concrete not meeting this specification's slump requirements will be rejected.
- k. Curing, stripping, and finishing shall be the same as for other structural concrete. Casing may be used as forms.
- l. Inspection of the concrete, ~~by the Division\*~~ as specified in subsection 625.7.2.6.
- m. Corrective measures for any unacceptable drilled shaft, removal of water from the CSL tubes and filling with an approved grout. All core holes, as specified in subsection 625.7.3, must be filled with an approved grout.

~~\*— For Design Build / Alternative Project Delivery projects, the Design Build Team are responsible for the testing, however all notifications to the Division are required.~~

### **625.6.1-Excavation:**

**625.6.1.1-Scope:** The Contractor shall perform all excavations required for the drilled shafts and the rock sockets, through whatever materials are encountered, to the dimensions shown in the plans, or required by the site conditions, or directed by the Engineer. The Contractor shall make each drilled shaft excavation available to the Engineer for inspection, providing tools, equipment, and safety measures as hereinafter specified. Based on preinstallation core hole information or on general inspection of the rock socket, the Contractor shall drill the rock socket deeper if directed by the Engineer.

**625.6.1.2-Excavation Through Overburden:** Unless otherwise shown in the plans, rock socketed drilled shaft excavations in the overburden shall be vertical bored holes extending from the ground surface down to the surface of competent rock. Temporary or permanent casings shall be required down to the competent rock surface and be seated in rock in a manner that prevents caving and minimizes the entry of ground water. In the event of a groundwater condition, appropriate measures shall be taken subject to the Engineer's approval. Such measures may include pumping from within the excavation, external dewatering, or excavation through a slurry-filled hole until the casing can be seated and sealed.

**625.6.1.3-Excavation in Rock:** Rock sockets shall be excavated to the dimensions and

depths shown in the plans, forming a bearing area at the bottom of the socket, flat to within a tolerance of ½ inch per foot. Each socket shall be excavated into continuous rock for the indicated length. Blasting methods will not be permitted.

The top elevation of competent rock must be confirmed as the socket drilling is started. The effective “top elevation” is based on observation of the boundary zone where broken or weathered rock becomes competent rock and is also influenced by the presence of any shale or coal seams. Based on that elevation, and the information from the preinstallation core hole, the Engineer will determine the final depth of socket and bottom elevation.

Upon completion of each rock socket excavation, the Engineer may (1) accept the socket, or (2) order deeper excavation based upon preinstallation core hole data or general inspection of the socket. The adequacy of each socket will depend on the soundness of its bottom surface and on the soundness of its underlying layers.

Contractor is cautioned not to over-drill the rock sockets. Unauthorized over-drilling will be at the Contractor’s expense. In the case where over-drilling would bring the drilled shaft base too close to a coal seam or other weak layer, then drilling must be extended through such weak layer, at the Contractor’s expense, to a satisfactory deeper bearing level as determined by the Engineer.

No portion of the rock socket shall be exposed to drilling fluid or groundwater for more than 96 hours. Any portion of the rock socket exposed to drilling fluid or water for more than 96 hours, and any portion of the rock socket which, in the opinion of the Engineer, has deteriorated due to exposure to air or water, shall be reamed with an approved grooving tool to a depth of not less than ¼ inch, or as directed by the Engineer. Reaming of the socket, if necessary, is considered incidental to the cost of drilling the rock socket, and no separate payment will be made for this work.

~~**625.6.1.4-Providing for Socket Inspection:** Upon completion of the excavation of each rock socket, and upon mechanical cleaning of the socket, the Contractor shall make the socket available to the Engineer for inspection, as specified in subsection 625.7. Blank.~~

**625.6.1.5-Disposal of Materials:** Disposal of excavated materials shall be accomplished under the general provisions of Section 207.6.

**625.6.1.6-River/Stream Area:** Rock socketed drilled shaft construction in the river/stream shall employ whatever special methods the Contractor finds necessary for access and for accomplishing the work. These methods may include cofferdams, temporary causeway, or other suitable measures. The Contractor will be responsible for conforming to all regulatory and environmental requirements related to the river/stream and for obtaining any permits that are required by their river/stream operations.

**625.6.1.7-Safety Measures:** Safety of all persons is to be considered an objective of the utmost importance on all projects. Therefore, the Contractor shall take whatever measures are necessary to protect their own personnel, subcontractors’ personnel, the Engineer or other agents of the state, regulatory personnel, and others including the general public. The following list is presented as representative of issues that the Contractor must address. It is not intended as all-inclusive and does not relieve the Contractor of conforming to other regulations, laws, requirements, or other measures reasonably required for safe excavating



operations. The Contractor shall develop a safety plan in accordance with these requirements and provide this plan to the Engineer for their review.

- a. Any required equipment within an excavation shall be operated by air or electricity. The use of gasoline-driven engines or diesel engines within an excavation will not be permitted. All lighting shall be electric, and precautions shall be taken regarding potential short circuits of electric current within ground water.
- b. The Contractor will take precautions to assure that no explosive or noxious gases are present. Fresh air shall be supplied into the excavation and foul air shall be removed whenever any personnel are present in the hole.
- c. A safety harness or chair lift, with separate safety line, protective cage, and two-way radio communication shall be used for any entry into an excavation.
- d. No open excavation shall be left unattended. During non-working hours, excavations shall be protected using solid, safe covers that are firmly fastened in place.

**625.6.2-Reinforcing Steel Installation:** Prior to installation of reinforcing steel, the steel cage shall be checked and cleaned of any materials that would tend to prevent bonding. The excavated hole shall also be checked, and any remaining or newly deposited debris shall be removed. Immediately upon the Engineer's approval of the condition of the cage and acceptance of the socket, and just prior to placement of concrete, the fully assembled cage of reinforcing steel shall be installed into the excavation.

The cage will consist of longitudinal (vertical) bars, spiral or tie bars, cage stiffener bars as required, spacing devices, and any other appurtenances required to maintain alignment, shape, and clearances. Cages shall include steel tubes and TIP wires in shafts where CSL and TIP testing is to occur as outlined in subsection 625.6.2.1. Each cage shall be placed in one unit by lowering into the hole in a manner that will prevent distortion. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals (near the bottom and at intervals not exceeding ten (10) feet along the rock socketed drilled shaft) to ensure concentric spacing for the entire cage length. The minimum number of centering devices at each level shall be three (3). All steel centering devices with less than three (3) inches of concrete cover shall be epoxy coated. The cage shall be supported from the top by use of a ground surface frame or other positive means. Setting the cage on the socket bottom without support will not be permitted. The Contractor may, with the approval of the Engineer, remove the top support after sufficient concrete has been placed to adequately support the cage vertically and prevent distortion or racking of the cage.

The bottom of the reinforcing steel cage shall be a minimum of three (3) inches and a maximum of twenty-four (24) inches from the bottom to the rock socketed drilled shaft excavation. Additional clearance may be approved by the Engineer.

All intersections of rock socketed drilled shaft reinforcing steel shall be tied with cross or "figure 8" ties. The reinforcing steel in the drilled shaft shall be 100% tied and supported so that the reinforcing steel will remain within allowable tolerances for position. Unless otherwise shown in the plans, splicing shall be by mechanical connectors or couplers which develop at least 125% of yield strength of the reinforcing bar. No more than 50% of the longitudinal reinforcing shall be spliced within 60 bar diameters of any lapped splice location or within two (2) feet of any mechanical splice or coupler location. Cage stiffener bars shall be used as required to provide a reinforcement cage of sufficient rigidity to prevent racking, permanent deformations, etc. during installation. If the concrete is to be placed by the free-fall method, these bars must first be removed.

In the event that the rock socketed drilled shaft has been excavated below the anticipated tip elevation, the reinforcing cage may be extended at the tip (bottom) end by lap splices, mechanical connectors, or welded splices in conformance with the Standard Specifications. In this instance, splices need not be staggered and 100% of the reinforcing bars may be spliced at a given location. Lap splice lengths shall be as shown in the plans or approved by the Engineer.

Prior to placing the reinforcement cage, the Contractor shall demonstrate to the satisfaction of the Engineer that the fabrication and handling methods to be used will result in a reinforcing cage placed in the proper position, with the proper clearances, and without permanent bending or racking of the reinforcement cage.

The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the rebar cage is not maintained within the specified tolerances, corrections shall be made by the Contractor to the satisfaction of the Engineer. No additional drilled shafts shall be constructed until the Contractor has modified the reinforcement cage support system in a manner satisfactory to the Engineer.

**625.6.2.1-Contractor Preparation for Testing:** To accommodate the CSL and TIP test requirements, the Contractor shall install the appropriate number of tubes and/or TIP wires in each drilled shaft to be tested. The number of tubes and wires per drilled shaft shall be as tabulated below:

**TABLE 625.6.2.1**

<b>Drilled Shaft Diameter</b>	<b>Number of CSL Tubes</b>	<b>Number of TIP wires</b>	<b>Tube / Wire Spacing</b>
Less than 42"	3	0	120°
42" to ≤ 60"	4	0	90°
> 60" to ≤ 96"	6	6	60°
Greater than 96"	8	8	45°

The tubes shall be per subsection 625.5.4. Each tube shall have a round, regular internal diameter free of defects or obstructions including defects or obstructions at pipe joints; in order to permit the free, unobstructed passage of 1½ inch diameter source and receiver probes. The tubes shall be watertight and free from corrosion with clean internal and external faces to ensure passage of the probes inside and a good bond with the concrete outside.

Each tube shall be fitted with a watertight shoe on the bottom and a removable cap or plug on the top. The tubes shall be securely attached to the interior of the reinforcing steel cage. The tubes are typically wire-tied to the reinforcing cage every forty (40) inches, or otherwise secured such that the tubes stay in position during placement of the cage and during placement of concrete. The tubes shall be installed in each shaft in a regular, symmetric pattern such that the tube spacing in degrees will correspond to that shown in the table above.

The tubes shall be as near to parallel as possible. They shall extend from six (6) inches above the drilled shaft bottom to at least forty (40) inches above the drilled shaft top. No tube may be allowed to rest on the bottom of a drilled excavation. If the drilled shaft top is sub-surface, then the tubes shall extend at least two (2) feet above the ground surface or above the water surface if the ground surface is below water. Any joints required to achieve full length tubes shall be made watertight. The Contractor shall investigate all CSL tubes, making sure

that there are no bends, crimps, obstructions or other impediments to the free passage of the testing probes. A record of the tube lengths, including a note of the projection of the tubes above the top of the shaft shall be made. The Contractor shall provide information on the shaft bottom and top elevations, length and construction dates to the Engineer prior to the CSL tests. Care shall be taken during placement of the reinforcing steel cage so as not to damage the tubes.

After placement of the cage, and before placement of concrete, the tubes shall be filled with clean water and the tube tops shall be capped or sealed to keep debris or other foreign matter out of the tubes. Care shall be exercised in the removal of caps or plugs so as not to apply excess torque, hammering, or other stresses that could break the bond between the tubes and the concrete.

The TIP wires shall be per subsection 625.5.5.

**625.6.3-Placement of Concrete:** Method of placement shall be determined by measuring the water infiltration rate into the shaft as specified in Section 625.7.2.2. Concrete placement for wet hole shall be placed by tremie. Free fall placement shall be permitted for dry hole condition, except that free fall height shall not exceed five (5) feet unless the concrete is placed using a drop chute or centering device. Free fall height is not restricted as long as a drop chute or centering device is used, and the concrete is directed down through the center of the shaft without directly hitting the reinforcing cage or the sides of the hole. Dry hole shall not have more than three (3) inches of water in the bottom of hole at start of concrete placement.

Prior to concrete placement, the Contractor shall make all necessary arrangements to ensure the uninterrupted delivery of concrete so that there will not be any cold joints in the drilled shafts. Placement of concrete shall generally conform to the applicable portions of Section 601.10. The rate of placement of concrete, as related to the height of fresh concrete at any time, will be subject to the Engineer's approval. The placement method will be developed by the Contractor, taking account of set time, hydraulic pressures and casing removal.

All costs of replacement of defective drilled shafts shall be the responsibility of the Contractor and shall be at no cost to the Division.

After the concrete level has reached the required top elevation, it shall be forced to overflow in the case of tremie or pump placement, leaving only fresh, uncontaminated concrete. In the case of placement by free fall (dry conditions), the concrete shall be continued high enough to compensate for any settlement due to removal of casing.

The top ten (10) feet of each rock socketed drilled shaft shall be vibrated except when more than ten (10) feet is to be exposed above the ground line or the riverbed/streambed, then the entire exposed portion shall be vibrated. The concrete shall not be vibrated until after any temporary casing is removed. Exposed portions of each rock socketed drilled shaft shall be cured in accordance with Section 601.12.

**625.6.4-Removal of Casing:** Removal of the casing from a shaft may occur gradually as concrete is placed. Insofar as possible, casing extraction shall be done at a slow uniform rate by application of a steady vertical upward pull in the direction of the axis of the shaft. To facilitate extraction, tapping on the casing, exertion of temporary downward pressure, slight rotation, or the controlled use of a vibratory hammer will be permitted, but care must be taken to avoid harmful impacts or disturbances to the fresh concrete. Vibration or rodding may not be used to break the casing loose for extraction.

If, during extraction of casing, upward movement of concrete and/or reinforcing steel occurs,

the Engineer shall be notified immediately. If the Engineer considers the movement to be minor, then the extraction of the casing may continue. If, however, the movement is deemed significant and indicative of squeezing of the surrounding soil thus resulting in a reduction of the drilled shaft diameter, then the Engineer may order the casing to be left in place, or permit extraction to proceed and order a later non-destructive load test, or may order other procedures as appropriate at no additional cost to the Division.

For the upper portions of rock socketed drilled shafts that will be exposed and visible, the casing may remain in place as a form until the concrete has attained a strength that enables it to stand alone without further deformation. Casing shall then be removed.

## **625.7-INSPECTION OF SOCKETS:**

**625.7.1-Inspection:** ~~The Engineer will inspect the shaft as outlined in subsections 625.7.2.4 and 625.7.2.5.~~

~~Time required for inspection will be considered incidental to the work and will not be cause for extra compensation related to a claim or extension of contract time.~~

~~The Contractor shall make each drilled shaft excavation available to the Engineer for inspection, providing tools, equipment, and safety measures.~~

~~The Contractor shall comply with the scheduling and notification requirements for drilled shaft construction outlined in Section 625.2.3, as well as 24-hour prior notification to the Technical Support Division via e-mail (DOHDrilledShafts@wv.gov) of the following testing:~~

- ~~1. Preinstallation core hole~~
- ~~2. Plumbness~~
- ~~3. Rock socket sidewall inspection~~
- ~~4. Shaft bottom cleanliness~~
- ~~5. In-place concrete quality testing~~

## **625.7.2-Division Drilled Shaft Testing:**

**625.7.2.1-Preinstallation Core Holes:** ~~The Contractor shall provide notice to the Technical Support Division via e-mail (DOHDrilledShafts@wv.gov) when each site is ready for drilling. The Division will commence drilling of the preinstallation core hole within 5 working days after notification from Contractor that site has suitable access for drilling.~~

A preinstallation test boring will be drilled ~~by the Division~~ at each rock socketed drilled shaft location, or as shown on the plans, to determine the character of the material that the rock socketed drilled shaft extends through and the material that is at the base of the shaft in order to ensure the material along and below the tip of the rock socket is capable of carrying the load that will be imposed on it. The preinstallation borings are to be drilled prior to beginning excavation for each representative rock socketed drilled shaft. ~~The Contractor shall provide all work necessary to allow access for the drill rig to the preinstallation test boring location, which at a minimum shall include constructing drill pads and access roads.~~

Unless otherwise directed, the preinstallation test borings are to be extended a minimum depth of two (2) upper drilled shaft diameters but not less than ten (10) feet below the planned tip elevation of the rock socketed drilled shaft shown on the plans. Standard Penetration Testing (SPT) and sampling shall be performed at five (5) foot intervals in the preinstallation borings in accordance with AASHTO T 206. Rock coring will be performed

in accordance with ASTM D2113 using a wireline core barrel system and will commence immediately upon obtaining an SPT value of 50 blows per six (6) inches or less on bedrock. The recovered core sample size will be approximately two (2) inch diameter (NX or NQ size). Additional preinstallation test borings in other locations may be required where directed by the Engineer.

Test boring logs of each preinstallation boring ~~will be prepared by the Division and~~ will be provided to the ~~Contractor~~ Division within three (3) working days of completion of the test boring. The preinstallation test borings logs will describe the type and thickness of all soil and rock layers, and locate the presence of groundwater, open joints, voids, soft rock, or other deleterious material. All recovered soil and rock samples shall be maintained by the Division Contractor and stored on site at suitable location ~~\_, provided by the Contractor,~~ until completion of the project.

Within 10 working days after completion of preinstallation core hole, the Engineer will notify the Contractor of the final tip elevations for each drilled shaft location.

**625.7.2.2-Wet or Dry Hole Determination:** The ~~Division will~~ Contractor shall check the depth of water at the bottom of the drilled shaft. If the depth does not increase by more than twelve (12) inches over a 1-hour period, the hole will be considered dry. Otherwise, the hole will be considered wet.

**625.7.2.3-Plumbness:** ~~Contractor shall provide notice to the Technical Support Division via e-mail (DOHDrilledShafts@wv.gov) five (5) working days prior to the date each drilled shaft will be ready for inspection.~~

Plumbness of the rock socketed drilled shaft/rock socket shall be measured by ~~the Division by~~ measuring the geometry of the drilled shaft excavation using SHAPE, Sonicaliper, or other suitable means approved by the Engineer. For any rock socketed drilled shaft, the maximum permissible deviation from plumb shall be 1.5% measured with respect to the vertical axis at the center of the drilled shaft excavation.

~~The Contractor shall provide suitable access and means for lowering inspection equipment into the drilled shaft excavation.~~

For any rock socketed drilled shaft at its top, the maximum deviation of the center shall be three (3) inches from its project plan location. The maximum deviation of the finished top of shaft from the plan elevation shall be minus one (1) inch or plus three (3) inches. An absolute minimum cover of three (3) inches to the reinforcing steel is strictly required. In the event of any deviations in the dimensional requirements, the contractor shall not proceed with construction of pier columns or cap until submission and approval of a corrective plan has been granted.

**625.7.2.4-Rock Socket Sidewall Inspection:** ~~Contractor shall provide notice to the Technical Support Division via e-mail (DOHDrilledShafts@wv.gov) five (5) working days prior to the date each drilled shaft will be ready for inspection.~~

The ~~Division will~~ Contractor shall inspect the rock socket side walls with a downhole camera or other suitable device. ~~The Engineer shall and~~ evaluate the rock quality and construction, as outlined in 625.6.1.3.

**625.7.2.5-Shaft Bottom Cleanliness:** ~~Contractor shall provide notice to the Technical~~

~~Support Division via e-mail (DOHDrilledShafts@wv.gov) five (5) working days prior to the date each drilled shaft will be ready for inspection.~~

The Contractor shall clean the rock socket so that a minimum of 75% of the base will have less than ½ inches of sediment at the time of placement of the concrete. Sediment depth at any location shall not exceed 1 ½ inches. The ~~Division-Contractor~~ shall determine shaft cleanliness by using a mini-SID, SQUID, or other suitable device approved by the Engineer. The contractor shall use an air-lift to achieve the required bottom cleanliness.

The Contractor shall begin concrete placement in the shaft within 3 hours after the shaft bottom cleanliness is approved. If concrete placement in the drilled is not started within 3 hours, the rebar cage shall be removed, and hole shall be re-inspected at no additional time to the Contractor or cost to the Division.

**625.7.2.6-In-place Concrete Quality Testing:** The Contractor shall furnish and place the Crosshole Sonic Logging (CSL) tubes and thermal integrity profiler (TIP) wires in all drilled shafts. The number of tubes and tip wires to be used shall be as specified in subsection 625.6.2.1. The ~~Division will~~ Contractor shall perform the testing and provide a report of the drilled shaft integrity testing to the ~~Contractor~~ Engineer. The CSL tubes shall remain open in the shaft and be grouted by the Contractor after acceptance of that shaft.

**625.7.2.6.1-Crosshole Sonic Logging (CSL):** The nondestructive testing method known as CSL shall be used on ~~any rock socketed drilled shaft which is constructed with the placement of concrete under wet conditions or as required in the plans~~ all rock socketed drilled shafts. The testing shall not be conducted until at least three (3) calendar days after placement of concrete is concluded in the drilled shaft and will be completed within fourteen (14) calendar days after such placement.

The CSL tests shall be conducted in conformance with ASTM D6760 ~~and by a testing company approved by Technical Support Division~~.

~~The Contractor shall comply with the scheduling and notification requirements for drilled shaft construction outlined in Section 625.2.3 by contacting the following Technical Support Division e-mail address: (DOHDrilledShafts@wv.gov). This will allow Technical Support Division to provide a qualified company to perform testing within the time frames allotted for in this subsection.~~

**625.7.2.6.1.1-CSL Testing Results:** The CSL test results ~~will~~ shall be compiled into a drilled shaft integrity testing report for each drilled shaft. The report will summarize and analyze any defect zones indicated on the logs. A copy of each report ~~will~~ shall be provided to the ~~Contractor~~ Engineer.

**625.7.2.6.1.2-Evaluation of CSL Test Results:** ~~The Engineer will review the report and, if the report determines that the drilled shaft is acceptable, will submit to the Contractor in writing within seven (7) calendar days approval to proceed with the work.~~

The rating of the rock socketed drilled shaft integrity ~~will~~ shall consider the increases in first arrival time (FAT) and the energy reduction relative to the FAT or energy in a nearby zone of good concrete. The criteria for rating the concrete from the CSL test will be:

<b>Rating</b>	<b>Criteria</b>
Good (G)	FAT increases 0-10% and energy reduction < 6 db
Questionable (Q)	FAT increases 11-20% and energy reduction < 9 db
Poor / Flaw (P/F)	FAT increases 21 to 30% or energy reduction of 9 to 12 db
Poor / Defect (P/D)	FAT increases 31% or more or energy reduction >12 db

Flaw or defect zones as indicated in Table 625.7.2.6.1.2 will be indicated on the logs and listed in a table within the report. The flaw or defect zones and their horizontal and vertical extent will be discussed in the report text. Flaws ~~will~~ shall be addressed by the ~~Division~~ Contractor if they affect more than 50% of the tested tube pairs at the same depth. Defects will be addressed by the ~~Division~~ Contractor if they affect two or more of the tested tube pairs at the same depth. At a minimum, addressing flaws and defects will include Crosshole Tomography (CT). If it is determined that the rating is less than Questionable, based on the results of the CSL and CT testing, the ~~Division will require core drilling and sampling by the Contractor~~ Contractor shall core and sample for further evaluation of the flaw or defect at no additional cost to the Division. ~~The diameter, number, depth, and location of cores shall be as directed by the Engineer.~~

~~The acceptance of each drilled shaft shall be the decision of the Engineer, based on the results of the drilled shaft integrity testing report and other information on the drilled shaft placement. Rejection of a drilled shaft shall require conclusive evidence that a defect exists in the drilled shaft, which will result in inadequate or unsafe performance under service loads. If the Non-Destructive Testing records are complex or inconclusive, the Engineer will require the Contractor to verify drilled shaft conditions by core drilling. If a flaw or defect is confirmed, the Contractor shall pay for all coring and grouting costs. If no flaw or defect is encountered, compensation for all coring and grouting will be in accordance with subsection 104.3 and 109.4.~~

~~**625.7.2.6.1.3 Remedial Action:** In the case that any rock socketed drilled shaft is determined to be unacceptable, the Contractor shall submit a plan for remedial action to the Engineer for approval. The approval or rejection of the remediation plan may take up to fourteen (14) calendar days. If the remediation plan is rejected the Contractor shall revise the plan and submit it for approval and the approval time is restarted. Any modifications to the rock socketed drilled shaft and load transfer mechanisms caused by the remedial action will require calculations and working drawings stamped by a Professional Engineer licensed in the State of West Virginia for all foundation elements affected. All labor and materials required to perform remedial drilled shaft action shall be provided at no cost to the Division and with no extension of the contract time.~~

**625.7.2.6.2-Thermal Integrity Profiler (TIP):** Perform TIP testing using the embedded thermal wire array, and in accordance with the ASTM D7949 (method b). Thermal integrity profiling is performed to evaluate shaft integrity and location of the reinforcing cage. The number of wires to be used shall be as specified in subsection 625.6.2.1. Thermal wire cables shall be connected to a thermal access port (TAP) immediately following casting.

~~The Contractor shall provide cooperative assistance and labor as required to assist the~~

~~Division in inspecting the thermal wires prior to concreting the shaft. Prior to TIP testing, the contractor shall provide shaft installation details to the TIP consultant. Because the method relies on the heat of hydration, tip testing is generally performed between 8 and 48 hours of concrete placement (note the optimum TIP testing time is dependent on shaft size and concrete mix and could range from 4 to 72 hours).~~

**625.7.2.6.2.1-Criteria to be used for acceptance or rejection of rock socketed drilled shaft using TIP testing:** The rating of the shaft integrity using tip shall consider variations in temperature as measured by the thermal wires. Potential local anomalies may be indicated by locally low temperatures relative to the average temperature at that depth, or average temperatures significantly lower than the average temperatures at other depths. The criteria for rating the concrete from the TIP test shall be:

Satisfactory (s) = 0 to 6% effective radius reduction and cover criteria met  
Anomaly (a) = effective radius reduction > 6% or cover criteria not met

When a tested shaft is categorized as anomaly (a), slices modeled at the area of question may be provided so that a structural evaluation of the shaft can be performed prior to implementing any corrective measures. Core drilling shall be performed to investigate problem areas found during TIP testing at no additional cost to the Division.

**625.7.3-Evaluation by Core Drilling:** A rock socketed drilled shaft that is found to be unacceptable, shall be core drilled by the Contractor in accordance with ASTM C42. Cores shall be four (4) inch nominal diameter. ~~One or more core holes shall be drilled at the location(s) as determined by the Engineer.~~ An accurate log of the core shall be kept, and the core shall be crated and properly marked showing the drilled shaft depth at each interval of core recovery. The core and one copy of the coring log shall be provided to the Engineer.

The Engineer shall determine if the rock socketed drilled shaft is acceptable. The Engineer will submit to the Contractor in writing within seven (7) calendar days approval to proceed with the work. If the quality of the drilled shaft is determined to be unacceptable, then the Contractor shall proceed in accordance with subsection 625.7.2.6.1.3.

The acceptance of each drilled shaft shall be the decision of the Engineer, based on the results of the drilled shaft integrity testing report and other information on the drilled shaft placement. Rejection of a drilled shaft shall require conclusive evidence that a defect exists in the drilled shaft, which will result in inadequate or unsafe performance under service loads. If the Non-Destructive Testing records are complex or inconclusive, the Engineer will require the Contractor to verify drilled shaft conditions by core drilling. If a flaw or defect is confirmed, the Contractor shall pay for all coring and grouting costs. If no flaw or defect is encountered, compensation for all coring and grouting will be in accordance with subsection 104.3 and 109.4.

**625.7.4-Remedial Action:** In the case that any rock socketed drilled shaft is determined to be unacceptable, the Contractor shall submit a plan for remedial action to the Engineer for approval. The approval or rejection of the remediation plan may take up to fourteen (14) calendar days. If the remediation plan is rejected the Contractor shall revise the plan and submit it for approval and the approval time is restarted. Any modifications to the rock socketed drilled shaft and load transfer mechanisms caused by the remedial action will require calculations and working drawings stamped by a Professional Engineer licensed in the State of West Virginia for all foundation elements affected. All labor and materials required to perform remedial drilled shaft



action shall be provided at no cost to the Division and with no extension of the contract time.

#### **625.8-METHOD OF MEASUREMENT:**

Rock socketed drilled shafts and Rock Socket foundations will be measured by the linear foot. For payment purposes, the drilled shafts are the portion from the finished top of each rock socketed drilled shaft to the top of competent rock. Rock Socket is the portion from the top of competent rock to the bottom of the drilled shaft rock socket as shown in the plans or as directed by the Engineer. Each measured drilled shaft is to be complete in place, accepted, and ready to function. "Top of drilled shaft" is the top of concrete as shown in the plans. "Top of competent rock" is as tabulated in the drilled shaft schedules in the plans unless a difference of one (1) foot or more is found during drilling.

Preinstallation core hole shall be measured by the linear foot based upon actual length drilled. The plan quantity will be based on one core hole, per drilled shaft, measured from the top shaft elevation to two drilled shaft diameters below the bottom of rock socket unless otherwise noted in the plans. No payment shall be made for additional length of preinstallation core hole drilled above the top of the drilled shaft.

#### **625.9-BASIS OF PAYMENT:**

The accepted quantities of rock socketed drilled shaft foundations, measured as provided above, will be paid for at the contract unit price per linear foot; complete in place including excavation, slurry if required, temporary or permanent metal casing, steel reinforcing, concrete, curing, and any required forming and finishing. No additional payment will be made for temporary casing that remains in place and pressure grouting due to the Contractor's inability to stabilize a drilled excavation, for the need to place concrete by tremie or pumping, for the need to use slurry for drilling, or for extra excavation and concrete that may be required due to drilling diameters larger than the minimum diameters specified. No additional payment will be made for methods employed to gain access to rock socketed drilled shaft construction or for means required to provide a dry working environment within the drilled shafts. Tubes for CSL testing, TIP wires, With the exception of preinstallation of core holes, all testing and other responsibilities related to testing and inspection assistance are incidental, with no separate payment being made.

#### **625.10-PAY ITEMS:**

<b>ITEM</b>	<b>DESCRIPTION</b>	<b>UNIT</b>
625001-*	Drilled shaft "D" Diameter	Linear Foot
625003-*	<u>Rock Socket "D" Diameter</u> <del>Rock Socket</del>	Linear Foot
<u>625005-*</u>	<u>Preinstallation Core Holes</u>	<u>Linear Foot</u>

\* Sequence number

D = Diameter of shaft or socket, in inches

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SPECIAL PROVISION**

**FOR**

**STATE PROJECT NUMBER:** \_\_\_\_\_

**FEDERAL PROJECT NUMBER:** \_\_\_\_\_

**SECTION 679**

**OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS**

**679.1-DESCRIPTION:**

ADD THE FOLLOWING SUBSECTION:

**679.1.3-Crack Treatment and Epoxy-Urethane Waterproofing Overlay for Bridge Decks:** This specification describes the Pre-treatment and Overlay consisting of multiple layers of hybrid polymer systems and a special blend of extremely hard aggregate designed to provide a minimum of a ¼-inch thick application for the purpose of complete waterproofing as well as providing a non-skid surface to withstand continuous heavy traffic and extreme changes in weather conditions.

**679.2-MATERIALS:**

ADD THE FOLLOWING SECTIONS:

**679.2.4-Crack Treatment and Epoxy-Urethane Waterproofing Overlay for Bridge Decks:** The following or equal to materials are acceptable for application of a bridge deck restoration system:

Pretreatment: Mark-135  
Overlay: Mark-163 Flexogrid  
as manufactured by Poly-Carb, Inc.  
33095 Bainbridge Road, Solon, Ohio 44139  
(440) 248-1223

**679.2.4.1-Pretreatment for Cracks System:** This two-part hybrid polymer shall be free of any fillers, volatile solvents and shall be formulated to provide a simple volumetric ratio of two components such as one to one or two to one by volume.

This hybrid polymer system shall be formulated to provide a unique combination of extremely low viscosity and low surface tension coupled with a built-in affinity for concrete and steel.

When Components A and B are mixed in the appropriate ratio, the cured resin shall conform to the requirements of Table 679.2.4.1.

<b>PHYSICAL PROPERTIES OF THE CURED SYSTEM</b>	
<b>Property</b>	<b>Value</b>
Compressive Strength, min. psi	5,500-6,000
Tensile Strength, min. psi	3,100-3,400
Tensile Elongation, percent min.	35 ± 5
Water Absorption, percent by wt. max.	<0.10
Shore D Hardness, 77°F, min	70 ± 5
Gel Time, minutes	48-52 (200 grams)
Adhesion to Concrete	100% Failure in Concrete
Surface Tension	Less than 32 Dynes/cc
Percent Solids	100%

**679.2.4.2–Epoxy-Urethane Co-polymer Overlay System:** The two-part epoxy-urethane co-polymer system shall be free of any fillers volatile solvents and shall be formulated to provide simple volumetric mixing ratio of two components such as one to one or two to one by volume.

The epoxy-urethane co-polymer system shall be formulated to provide flexibility in the system without any sacrifice of the hardness, chemical resistance or strength of the epoxy-urethane co-polymer system. Use of external/conventional flexibilizers are not acceptable. Flexibility shall be introduced by interaction of elastomers to chemically link in the process of curing so that the flexibility of the molecule is least affected during the low temperature conditions that are confronted in actual use.

When Components A and B Care mixed in the appropriate ratio, the cured resin shall conform to the requirements of Table 679.2.4.2A. (Test methods are discussed in detail in Item 3 of this specification.)

<b>TABLE 679.2.4.2A</b>	
<b>PHYSICAL PROPERTIES OF THE CURED SYSTEM</b>	
<b>Property</b>	<b>Value</b>
Compressive Strength, min. psi	7,000
Tensile Strength, min. psi	2,500
Tensile Elongation, percent min.	35 ± 5
Water Absorption, percent by wt. max.	<0.20
Shore D Hardness, 77°F, min	65 ± 5
Gel Time, minutes	22-31 (200 grams)
Abrasion Resistance, mg. max.	85
Adhesion to Concrete	100% Failure in Concrete
<b><i>Flexural Creep: Total Movement in 7 Days</i></b>	<b><i>0.0065 inches</i></b>
Flexural Yield Strength, min. psi	5,000
Percent Solids	100%

The modulus of the cured epoxy-urethane system determined by variable temperature Dynamic Mechanical Analysis (DMA) using DMA instruments such as Paar Physica UDS-200, shall conform to the following minimum values as given in Table 679.2.4.2B.

<b>TABLE 679.2.4.2B</b>		
<b>VISCO-ELASTIC PROPERTIES OF THE CURED SYSTEM</b>		
<b>TEMPERATURE</b>	<b>STORAGE MODULUS DYNES/SQ. CM.</b>	<b>LOSS MODULUS DYNES/SQ. CM.</b>
15° F (-10°C)	1 x 10 <sup>10</sup>	6 x 10 <sup>8</sup>
70° F (20°C)	7 x 10 <sup>9</sup>	9 x 10 <sup>8</sup>
120° F (50°C)	4 x 10 <sup>8</sup>	3 x 10 <sup>8</sup>
140° F (60°C)	1 x 10 <sup>8</sup>	7 x 10 <sup>7</sup>
160° F (70°C)	6 x 10 <sup>7</sup>	2 x 10 <sup>7</sup>

The tests shall be conducted at a frequency of 1 Hz with a 0.3% strain in accordance with the guidelines described in the testing equipment manual.

The cured epoxy-urethane system must exhibit the following load bearing capacity. At approximately 20% strain, the polymer shall retain at least 85% of its original load bearing strength (tensile stress) as per ASTM D-638.

**679.2.4.3–Aggregate:** Aggregate used for all layers shall be non-friable, non-polishing, clean and free from surface moisture. It shall be durable and sound and have a proven record of performance in applications of this type. The aggregate shall be 100 percent fractured, thoroughly washed and kiln dried to a maximum moisture content of 0.2 percent by weight, measured in accordance with ASTM C566. The fracture requirements shall be at least one

mechanically fractured face and will apply to materials retained on U.S. No. 10 sieve. The recommended aggregate is Washington Stone and its properties are as follows:

Glacial Gravel	Basalt Quartzite Granite (% by Weight)
SiO <sub>2</sub>	75.03
Al <sub>2</sub> O <sub>3</sub>	11.49
Fe <sub>2</sub> O <sub>3</sub>	3.57
CaO	2.84
MgO	1.59
SO <sub>3</sub>	0.08
Na <sub>2</sub> O	2.58
K <sub>2</sub> O	0.99
Combined alkali	3.20
Ignition loss	1.72

Alternate aggregates may be allowed upon written approval by the manufacturer of the hybrid polymer systems. Aggregate for all layers shall have a minimum Mohs scale hardness of 6.5. The grading of the aggregate shall conform to the requirements of Table 679.2.4.3.

TABLE 679.2.4.3	
AGGREGATE GRADATION	
Sieve Size	Percent Passing
No. 6	80-100
No. 10	10-35
No. 20	0-10

**679.2.5–Method of Testing:** Tests shall be conducted in accordance with the following methods:

**679.2.5.1–Compressive Strength:** ASTM C109, Compressive Strength of Hydraulic Cement Mortars. The two components of the resin are to be thoroughly mixed in their appropriate ratios. Two volumes of graded silica sand in accordance with ASTM C778 shall be added to one volume of mixed resin. The samples shall then be prepared according to the requirements of ASTM C109 and allowed to cure for 7 days at  $73.5 \pm 3.5^{\circ}\text{F}$ .

**679.2.5.2–Tensile Strength and Elongation:** ASTM D638, Tensile Properties of Plastics, Specimen Type I or Type II. Samples shall be cured at  $73.4 \pm 3.6^{\circ}\text{F}$  and  $50 \pm 5\%$  relative humidity. Speed of testing shall be at 0.5 in./min.

**679.2.5.3–Water Absorption:** ASTM D570, Water Absorption of Plastics. Sample specimens shall be prepared and allowed to cure at  $73.4 \pm 1.8^{\circ}\text{F}$  and  $50 \pm 5\%$  relative humidity.

**679.2.5.4–Shore D Hardness:** ASTM D2240, Rubber Property – Durometer Hardness. Specimen shall be prepared as per ASTM D570 and allowed to cure at  $73.4 \pm 3.6^{\circ}\text{F}$ .

**679.2.5.5–Gel Time:** The following procedure shall be used to determine gel time. Measure 4 oz. of Part A and 2 oz. of Part B each at  $77^{\circ}\text{F}$ , into an unwaxed paper cup and record the time and mix immediately. 100 gms of this mixture shall be poured into a 6 oz. unwaxed paper cup and placed on a wooden bench top. Starting twenty minutes from the time recorded above, the mixture shall be probed every two minutes with a small stick until a small ball forms in the center of the container. The total time, including mixing, required for the ball to form shall be regarded as the gel time. The test shall be performed in a room or enclosed area maintained at  $77 \pm 3.6^{\circ}\text{F}$  and  $50 \pm 5\%$  relative humidity.

**679.2.5.6–Abrasion Resistance:** ASTM C501, Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abrader. Tests shall be done using a CS-17 wheel and a 1,000 gram load for 1,000 cycles.

**679.2.5.7–Adhesion to Concrete:** ACI-503-R; Pull Out Test.

**679.2.5.8–Flexural Creep:** California Test Method 419.

**679.2.5.9–Flexural Yield Strength:** ASTM D-790.

**679.2.5.10–Surface Tension:** ASTM D-971

### **679.3-CONSTRUCTION METHODS:**

ADD THE FOLLOWING SUBSECTION:

**679.3.8-Repair of Spalled Areas:** Deck patching shall be performed as outlined in Proposal Note utilizing Type I patching material. All patching materials shall be free of Magnesium Phosphate.

Patching shall be scheduled so that the bridge can be open to traffic during all non-working hours.

Traffic shall be allowed to use the bridge during the curing period.

**679.3.9-Surface Preparation:** The entire concrete deck shall be cleaned by shotblasting to remove any oil, dirt, rubber or any other potentially detrimental material such as curing compound and laitances which, in the manufacturer and engineer's opinion, would prevent proper bonding to and curing of the material. The shotblasting shall be provided by or approved by the manufacturer to ensure the highest quality preparation and longest life of the system.

In areas that the shotblasting equipment cannot reach (i.e., along curbs and median walls), sandblasting is permitted to an extent satisfactory to the manufacturer and engineer. This should be performed prior to the shotblasting whenever applicable and practical.

For asphalt surfaces, the asphalt deck shall be thoroughly power washed to remove any oil, dirt, rubber or any other potentially detrimental material which, in the manufacturer and

engineer's opinion, would prevent proper bonding to and curing of the material. This should be done not more than 24 hours prior to application unless otherwise approved by the manufacturer.

Steel surfaces such as expansion joints, sidewalks, steel grids and steel plate to be treated with the restoration system, shall be shot or sand blasted clean to SSPC-SP-6 standards. Note: For steel plate decks please consult POLY-CARB for appropriate specification.

Traffic shall not be allowed on any portion of the deck which has been shotblast or on which part of the overlay has already been placed. The overlay application equipment, however, will be allowed to drive on the deck surface during application provided precautions have been taken to insure that the deck surface will not become contaminated.

All surfaces to be treated shall be dry at the time of application. Immediately before the application of any liquids, all prepared surfaces shall be cleaned with compressed air (or vacuumed) to remove dust and debris.

The application of the system shall not be made when it has rained 24 hours before application and rain is forecast within eight hours after application or as determined by the manufacturer (fog and high humidity will not impede the application of or affect the performance of the overlay). If waiting for 24 hours is impractical, the moisture content in concrete substrate shall not exceed 4.5% when measured by an electronic moisture meter. Any exception shall be determined by the moisture content present in the deck which shall not exceed 75% of air entrainment in the mix design.

The minimum recommended temperature in which the system shall be applied is 50°F and rising. All applications at temperatures below 50°F shall require prior written approval from manufacturer.

**679.3.10-Application of Overlay:** The manufacturer shall have a representative on the jobsite at all times who, upon consultation with the engineer, may suspend any item of work that is suspect and does not meet the requirements of this specification. Resumption of work will occur only after the manufacturer's representative and the engineer are satisfied that appropriate remedial action has been taken by the contractor.

The overlay shall be applied on all deck areas using metering, mixing and distribution machinery owned and operated by the manufacturer. The application machine shall feature positive displacement volumetric metering pumps controlled by a hydraulic power unit. Components A and B shall be stored in temperature controlled reservoirs capable of maintaining 100°F ± 10°F to insure optimum mixing. Ratio check verification at the pump outlets as well as cycle counting capabilities to monitor output will be standard features. In line mixing shall be motionless so as to not overly shear the material or entrap air in the mix. The machine shall also make maximum use of the working time of the material to insure proper "wetting" of the system by mixing it immediately prior to dispensing onto the deck.

The number of layers (a minimum of three) and the application rates of the liquid in the various layers shall be as recommended by the manufacturer in order to achieve a minimum overlay thickness of 1/4 inch.

**679.3.10.1-Application of Pre-Treatment:** After manually or mechanically measuring and mixing of the components, the liquid shall be evenly distributed on the clean, dry deck surface at the rate as recommended by the manufacturer. After the entire deck surface is wet, allow 1-2 hours for the liquid to achieve full depth penetration into cracks as well as adequately encapsulate the steel grid if any.

After the liquid is allowed to penetrate, medium size coarse silica sand may be broadcast evenly if the subsequent application is going to be applied after 8-12 hours.

**679.3.10.2-Overlay (Second and Third Layers):** Prior to the application, if there exists any excess or loose aggregate from the previous coat, such excess aggregate shall be completely removed by vacuum or with compressed air. After mixing of the components via the mechanical application equipment, the liquid shall be evenly distributed on the clean, dry deck surface at the rate as recommended by the manufacturer.

After the application of the liquid in the second and third coats, the maximum time allowed before broadcasting of the aggregate is as follows:

Above 90°F	10 minutes
80°F to 90°F	15 minutes
70°F to 80°F	20 minutes
60°F to 70°F	25 minutes
50°F to 60°F	35 minutes

Broadcasting on decks shall be by truck-mounted equipment capable of dispensing the aggregate onto the deck in a uniform manner as directed or otherwise approved by the manufacturer.

The aggregate shall be broadcast as described below to cover the surface so that no wet spots appear, before the co-polymer begins to gel. The aggregate must be dropped vertically in such a manner that the level of the liquid is not disturbed.

In the first and second layers of the FLEXOGRID liquid, aggregate conforming to Table 679.2.4.3 shall be broadcast to saturation, until no wet spots remain.

**Removal of Excess Aggregate:** After the overlay has hardened, removal of all loose and excess aggregate with a power vacuum or other method shall be made prior to the application of subsequent coats.

Joints in the Overlay (i.e., between two adjacent lanes) shall be staggered and overlapped between successive coats so that no ridges will appear.

Traffic may be allowed on the final layer or in between layers after the resin has cured (as determined by the manufacturer) and after removal of all excess, loose aggregate.

## **679.4-CONSTRUCTION LIMITATIONS AND REQUIREMENTS:**

ADD THE FOLLOWING SUBSECTION:

### **679.4.10-Storage and Handling:**

- i. **Liquid Material:** All material shall be transported and stored in their original containers inside a dry, temperature controlled facility and maintained at a minimum temperature of 60°F and not to exceed 120°F.
- ii. **Job Site Storage:** The materials shall be stored on the jobsite in a dry, weather protected facility away from moisture and within the temperature range of 60°F to 90°F. When the materials are transported or stored on the job in the application machine tanks, the material must also be maintained at a temperature of 60°F to 90°F.
- iii. **Handling of Liquid Materials on the Job:** Protective gloves, clothing, boots and goggles shall be provided to workers and inspectors directly exposed to the material.



Product safety data sheets shall be provided to all workers and inspectors as obtained from the manufacturer.

- iv. **Packing Requirement:** All materials must be packaged in strong, substantial containers. The containers shall be identified as Part A and Part B and shall be plainly marked with the name and address of the manufacturer, name of the product, mixing proportions and instructions, lot and batch numbers, date of manufacture, and quantity contained therein.
- v. **Aggregate:** All aggregate shall be stored in a dry, moisture-free atmosphere. The aggregate shall be fully protected from any contaminants on the jobsite and shall be stored so as not to be exposed to rain or other moisture sources.

#### **679.6-METHOD OF MEASUREMENT:**

ADD THE FOLLOWING SUBSECTION:

**679.6.6-Crack Treatment and Epoxy-Urethane Waterproofing Overlay For Bridge Decks:** The quantity of work performed for Crack Treatment And Epoxy-Urethane Waterproofing Overlay For Bridge Decks shall be measured in square yards and incidental to Item 679007.

#### **679.7-BASIS OF PAYMENT:**

ADD THE FOLLOWING SUBSECTION:

**679.7.2-Sampling and Acceptance:** The manufacturer of the system shall provide evidence of field performance and lab performance with infrared spectra in order to obtain state approval of the overlay system for use on the project. A nationally recognized independent lab must verify that the material:

- i. Has the capability of preventing the ingress of essentially all chloride ions into the concrete at 1" depth when tested according to NCHRP-244 method.
- ii. Has the capability to de-activate the existing chloride ions present in the concrete specimen so that the corrosion of steel rebar embedded in the concrete stop corroding.
- iii. When tested as per Table 679.2.4.1, Table 679.2.4.2A, and Table 679.2.4.2B, fully comply with the test results specified for cured system.

In addition to the initial certification process each manufacturer shall furnish the state an infrared spectra of each component of system for its permanent record and for individual installation verification.

The selected material must have verifiable satisfactory performance of at least 8 (eight) years in the state and/or 8 (eight) years of satisfactory performance in the United States or Canada.

At the pre-construction conference, the contractor shall notify the state project engineer of the source of material.

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Test results certified and verified by a nationally recognized independent testing laboratory verifying properties of the cured system as per Table 679.2.4.1, Table 679.2.4.2A & Table shall be submitted to the engineer for approval prior to the bid opening. This certification shall be provided on each lot number to be used on the project.

Infrared spectra of each component from each lot number (to be used on the project) shall be submitted with the independent lab certification.

The manufacturer shall furnish at least a one-quart sample of each component from each lot to the DOT laboratory to verify material supplied by the manufacturer.

**679.7.2.1-Performance Acceptance and Guarantee:** The state shall be notified of the number of gallons used on the project with two notarized statements – one from the contractor and one from the manufacturer. In addition, the contractor shall verify to the State that the overlay is at least ¼ inch thick at three random locations selected by the engineer for every 1,000 square yards of deck surface. Thin areas shall be re-coated as described above by the contractor and re-verified at no additional cost to the State. This verification may consist of cores, holes, etc., but in all cases, any destructively tested areas shall be repaired by the contractor before final acceptance by the engineer.

**679.8-PAY ITEM:**

ADD THE FOLLOWING ITEM TO THE TABLE:

ITEM	DESCRIPTION	UNIT
679007-*	Crack Treatment and Epoxy-Urethane Waterproofing Overlay for Bridge Decks	Square Yards

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 703  
COARSE AGGREGATE**

**703.1-CRUSHED STONE:**

**703.1.5-Limestone Anti-Skid Aggregates:**

**703.1.5.2-Dolomite Limestone:**

DELETE AND REPLACE THE CONTENTS OF THE FOLLOWING SUBSECTION:

When produced for anti-skid, shall be sampled from the stockpile by the Division. The stockpile shall meet the requirements for Section 703.1, with the addition of ASTM C1271 ~~and~~ or ASTM C1301. Dolomite shall contain a minimum of 10% elemental magnesium.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 707**

**CONCRETE ADMIXTURES, CURING AND COATING MATERIALS**

**707.2-WATER-REDUCING AND RETARDING ADMIXTURES FOR CONCRETE:**

**707.2.2-Performance Requirements for Concrete Retarders:**

**707.2.2.1-**

DELETE THE THIRD PARAGRAPH IN THE SUBSECTION:

~~When a Type G admixture is used for the sole purpose of increasing the slump of the subject concrete mix (no water is removed when this admixture is added), the requirements of AASHTO M 194 for water reduction and compressive strength increases will be waived.~~

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**SUPPLEMENTAL SPECIFICATION**

**FOR**

**SECTION 715  
MISCELLANEOUS MATERIALS**

**715.9-WARNING DEVICES:**

**715.9.6-Portable Sign Stands:**

**715.9.6.1-Product Submission and Approval:**

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING:

Stands to be considered for inclusion on the Division's Approved Products List (APL) shall be submitted to the Materials Division following the current procedures specified in MP 106.00.02. The Division maintains an APL of MASH compliant stands only. Stands utilized based on compliance with NCHRP-350 are not required to be listed on an APL.

The manufacturer should include all relevant documentation and information, including but not limited to Product Data Sheets, Product Flyers, Manufacturer Product Specifications, Product Bulletins, Engineering Drawings, and crash testing performance documentation. The crash testing performance documentation to be submitted shall be in accordance with official guidance issued by the WVDOH.

The stands shall be evaluated as per MP 715.09.20, "Standard Method for Determining the Stability of Portable Sign Stands."

Approvals of stands may be rescinded based on performance on Division projects determined to be non-compliant with these specifications.

**WEST VIRGINIA DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
SPECIAL PROVISION**

**FOR**

**STATE PROJECT NUMBER:** \_\_\_\_\_

**FEDERAL PROJECT NUMBER:** \_\_\_\_\_

ADD THE FOLLOWING:

**SECTION 900  
RAILROAD**

**900.1-GENERAL:**

The work shall include all material for the replacement of existing rail and components along the South Branch Valley Railroad (SBVR) and shall meet requirements as set for by SBVR.

The limits of work are MP 23.2 to MP 31.5 and MP 32.0 to MP 34.3

**900.2-900.5-Blank**

**900.6-OTHER TRACK MATERIAL**

The work shall include the procurement, storage, and distribution of Other Track Material (OTM) for use during the removal of the existing jointed rail followed by the installation of new continuous welded rail (CWR).

**900.6.1-Materials:** The Contractor shall procure all OTM required for the installation of the CWR. The OTM shall include, but is not limited to Spikes, Rail Anchors, Bolts and Nuts, Spring Washers, Joint Bars and Compromise Bars, and Thermite Welds.

**Spikes** - The Contractor shall procure 6” soft-steel track spikes to fasten the CWR to ties. The track spikes shall be manufactured to meet the requirements of AREMA Chapter 5, Track, Part 2, Section 2.1 Specifications for Soft-Steel Track Spikes, current issue.

**Tie Plugs and Synthetic Tie Plugging Materials**-The Contractor shall procure wood tie plugs and/or synthetic tie plugging material to fill holes in ties after spikes have been removed. Tie plugs and/or synthetic tie plugging materials shall be manufactured to meet the requirements of AREMA Chapter 30, Ties, Part 3, Section 1.5 Specifications for Tie Plugs and Synthetic Tie Plugging Materials, current issue.

**Rail Anchors**-The Contractor shall procure and apply rail anchor to all newly laid CWR as required in CWR Procedures – SBVR. Rail anchors shall be drive-on or spring-type

either new, or remanufactured to meet the requirements of AREMA Chapter 5, Track, Part 7, Section 7 Rail Anchors, current issue.

**Bolts, and Nuts-**The Contractor shall procure sufficient bolts and nuts to fasten joint bars between strings of CWR as the work progresses. Bolts and nuts shall be heat-treated carbon steel track bolts, and carbon-steel nuts manufactured to meet the requirements of AREMA Chapter 4, Part 3, Section 5 Specifications for Heat-Treated Carbon Steel Track Bolts and Carbon-Steel Nuts, current issue.

**Spring Washers-**The Contractor shall procure sufficient spring washers to be used on the bolt between the splice or compromise bar and the nut. Spring washers shall be steel manufactured to meet the requirements of AREMA Chapter 4, Part 3, Section 6 Specifications for Spring Washers current issue.

**Joint Bars and Compromise Joint Bars-**The Contractor shall procure sufficient joint bars to connect similar weight / section strings of CWR and compromise joint bars to connect CWR to a differing weight / section of the existing bolted rail as the work progresses. They shall be quenched carbon-steel joint bars, or microalloyed joint bars, or forged compromise joint bars that meet the requirements of AREMA Chapter 4, Part 3, Section 4, Specifications for Quenched Carbon-Steel Joint Bars, Microalloyed Joint Bars, and Forged Compromise Joint Bars, current issue.

**Rail Welds-**The Contractor shall procure sufficient thermite welds to connect the strings of rail after they are laid, and adjusted for the Desired Rail Neutral Temperature per the South Branch Valley Railroad CWR Plan. Rail Welds shall meet the requirements of AREMA Chapter 4, part 3, Section 13, Specifications for the Quality Assurance of Thermite Welding of Rail, current issue.

**900.6.2-Submittals:** Submit documentation for all OTM confirming that all OTM meets AREMA specification.

Submit storage locations, and timing for delivering, unloading, handling, and storing OTM.

Submit plan for distributing all OTM at locations where it is required for the installation of the CWR.

Submit documentation that the thermite welds meet the requirements of AREMA Chapter 4, Part 3, Section 13, Specifications for the Quality Assurance of Thermite Welding of Rail, current issue.

Submit documentation that thermite welds have been tested at the frequency required in AREMA Chapter 4, Part 3, Section 13.5 Frequency of Testing, current issue.

Submit documentation that all thermite welds have been tested to meet AREMA Chapter 4, Part 3, Section 13.3.4, 5, and 5a Weld Finished Dimensional Tolerances of the Railhead, current issue.

**900.6.3-Delivery, Storage and Handling:** Load, transport, unload, store, and handle OTM in a manner which will prevent damage to the trackwork materials. Items which are included in the AREMA "Manual of Railway Engineering" shall be handled as described therein.

Move all material on site in a manner which prevents damage to existing above and below ground installations.

Repair, correct, or replace damage to existing installation or SBVR owned materials caused by Contractor at no cost to the SBVR.

Unload OTM at locations where it will not be a tripping hazard, near where it is intended to be installed, not in the gage of the track, and clear of the top of the ends of the ties and ballast shoulder.

**900.6.4-Inspection:** Inspect the construction site prior to work for any discrepancies with proposed installation plans and bring the discrepancies to the Engineer's attention.

Examine alignment and elevation of existing work for interface with work of this Section. Obtain authorization from Engineer before work of this Section is started for adjustments at interfaces with existing work.

Inspect locations where CWR is distributed prior to distribution of OTM.

**900.6.5-Execution:** All OTM installed in conjunction with the installation of the CWR shall meet the requirements of the "South Branch Valley Railroad CWR Plan Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR as Required by 49 CFR 213.118"

The Contractor shall have on site appropriate supervision that is qualified under CFR 213.7 to supervise the installation of CWR. Contractor's supervisor is to be properly equipped and qualified to properly determine that the rail installation temperature is within the designated rail installation range. The Desired Rail Neutral Temperature (DRNT) and designated rail installation range is as indicated in the CWR Procedures – SBVR.

**900.6.6-Method of Measurement:** No separate measurement shall be made for work of the Section.

**900.6.7-Basis of Payment:** No separate payment will be made for work of this Section.

## **900.7-SURVEYING**

The Contractor shall employ a Land Surveyor licensed in West Virginia to conduct a centerline survey of the existing SBVR track at full stations and half stations. From that existing survey, design a Best-Fit Existing Centerline.

The Contractor may utilize the RailPod survey to complete this work. Contact Joe Mahoney [jmahoney@rail-pod.com](mailto:jmahoney@rail-pod.com) 815-641-0957.

**900.7.1-Submittals:** The Contractor shall submit the credentials of the Land Surveyor licensed in West Virginia to the Engineer.

The Contractor shall submit a Survey Control Plan that identifies horizontal and vertical survey control points and base lines the Contractor will use during survey to the Engineer for review and approval.

The Contractor shall compare the Best-Fit Existing Centerline survey to the SBVR Track Maps and resolve discrepancies with the Engineer. A Proposed Track Centerline will be designed by the Contractor for the review and approval of the Engineer.

The Proposed Track Centerline shall be made a part of the Install Ballast and Surface.



Record and submit all field survey data in both AutoCAD Version 2018 and Microsoft Excel format.

On request, the Contractor shall submit documentation verifying accuracy of survey work.

**900.7.2-Inspections:** The Contractor shall, at the request of the Engineer, jointly inspect and verify the accuracy of any part or parts of the survey work.

The Contractor shall maintain a complete and accurate log of survey control and field measurement data as work progresses and make that data available to the Engineer immediately upon request.

**900.7.3-Execution:** The Contractor shall tie into the identified control points and conduct a Best-Fit Centerline survey of the existing SBVR track at full stations and half stations prior to laying CWR.

The survey shall include locations by station of road crossing centerline, length of the crossing and the name or identification of the crossing, existing Mile Post markers, bridge ends, the middle of the bridge, the supporting structures, and the name of the bridge, and other points as directed by the Engineer.

After comparing this survey of the existing track to the SBVR Track Maps, a Proposed Track Centerline will be designed by the Contractor as the basis for a proposed track alignment. The Proposed Track Centerline will be reviewed, and if acceptable, approved by the Engineer. It shall be made a part of the Install Ballast and Surfacing Work Plan.

**900.7.4-Method of Measurement:** Payment of surveying shall be on a lump sum basis.

**900.7.5-Basis of Payment:** The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work. Progress payments can be made in proportion to the amount of work determined to be completed by the Engineer.

## **900.8-FURNISH RAIL**

The work shall include the procurement, of rail, and welding the rail into strings of CWR delivered to SBVR.

The rail will be unloaded at locations as directed by the SBVR Employee-in-Charge (EIC).

**900.8.1-Materials:** Rail shall be new 136# or second hand 133# CWR manufactured to meet American Railway Engineering and Maintenance-of-Way Association (AREMA), Manual for Railway Engineering (MRE), current issue. The 133# rails shall be classified as Second Hand, and Controlled Cooled per AREMA Chapter 4, Rail, Part 3, Section 3.12. They shall be Reconditioned and Graded as Class 1 per AREMA Table 4-3-17. Rail Grading Classification by Wear.

Weld sample testing shall be submitted prior to acceptance of the CWR.

The welding of the individual rails to form CWR shall be as required by AREMA Chapter 4, Part 3, Section 3.11 Specification for Fabrication of Continuous Welded Rail shall apply.

**900.8.2-Submittals:** Submit certification that the Second Hand 133# rail is Controlled Cooled, Reconditioned, and Graded as Class 1 per AREMA Table 4-3-17, Rail Grading Classification by Wear, current issue, prior to shipping the rail, or CWR to SBVR.

Submit certification that the electric flash-butt welding process(es) if used to fabricate the CWR meets the requirements of AREMA Chapter 4, Part 3, Section 3.10 Specification for the Quality Assurance of Electric-Flash Butt Welding of Rail, current issue, prior to delivering the CWR to SBVR, or fabricating CWR at SBVR site(s).

Submit weld testing data including Dimensions, and Magnaflux tests for every weld, copies of all Microstructure tests performed as needed, and copies of the several other tests as specified in AREMA Chapter 4, Part 3, Section 10, and Table 4-3-16 Frequency of Testing, current issue, prior to acceptance of the CWR by SBVR.

Submit a CWR Work Plan for the Engineer's review and approval that includes procedures for fabricating, delivering, staging, handling, and unloading the CWR prior to shipment of the rail or CWR.

Submit as a part of the CWR Work Plan details of all pre-inspections, site preparation, handling methods, unloading equipment, methods, and access requirements. Include equipment, labor, and schedule requirements for each activity.

Submit unloading equipment data for review and approval by the Engineer showing compliance with gage, loads, and clearances for on-track equipment.

**900.8.3-Inspection:** Inspect the construction site prior to work for any discrepancies with the CWR Work Plan, or proposed rail or CWR unloading, distribution, or installation plans.

Examine alignment and elevation of existing track for interface with work of this Section. Obtain authorization from Engineer before beginning the work of this section for adjustments at interfaces with existing work.

**900.8.4-Execution:** Equipment: Operate work trains and equipment over track and turnouts only after approval by EIC.

CWR strings shall be delivered by train, or other means if fabricated on SBVR site. It shall be distributed in strings of CWR alongside the track adjacent to the location in which the CWR will be laid.

Receive, transport, handle and distribute rail as shown in the approved CWR Work Plan in a manner which will prevent damage to the rail or surrounding structures.

Unless specified otherwise herein, rail distribution shall comply with AREMA Specifications.

**900.8.5-Method of Measurement:** The quantity to be paid for CWR shall be the lineal feet of CWR delivered and unloaded as shown in the approved CWR Work Plan and accepted by the Engineer.

**900.8.6-Basis of Payment:** The Unit Price bid for this item shall be full compensation for furnishing all labor, materials, tools, and equipment necessary to furnish, deliver, and unload the CWR as shown in the approved CWR Work Plan.

### **900.9-INSTALL CONTINUOUS WELDED RAIL (CWR):**

The work shall include the removal of the existing jointed rail followed by the installation of CWR. The CWR will be installed at locations as indicated in the Contractor prepared, and SBVR accepted Rail Laying Work Plan.

**900.9.1-Materials:** CWR: The Contractor shall remove the existing bolted rail, and install CWR.

**Alternate 1** – The Contractor shall assume possession of the jointed rail removed from track, and any removed OTM or scrap. The jointed rail, OTM, and scrap shall be removed from SBVR property within 30 days.

**Alternate 2** – The SBVR shall retain possession of the jointed rail removed from track. The Contractor shall neatly stack the released rail with its base down, and adequately supported, in areas designated by the Engineer. The Contractor shall assume possession of the removed OTM, and scrap removed from track. The OTM shall be removed from SBVR property within 30 days.

All OTM used for this work shall be furnished and distributed by the Contractor. Any material distributed by the Contractor, which has not been approved, is lost, stolen, or damaged shall be replaced by the Contractor at its cost and expense. OTM released during the removal of the bolted rail shall be collected into piles placed clear of the end of ties and ballast shoulder.

Existing compromise bars between existing CWR and existing jointed rail may be removed and moved forward to the end of the CWR that is laid during a track outage. The compromise bars shall remain the property of SBVR and shall be wired together and promptly returned to SBVR at the end of their use.

**900.9.2-Submittals:** The Contractor shall submit a Rail Laying Work Plan to the Engineer for his review and approval prior to the delivery of the CWR or OTM. The Rail Laying Work Plan shall include all preconstruction, construction, and post construction activities. It shall include the selection of alternatives for the released bolted rail and OTM as well as all required inspections, site access points, material storage locations and handling methods, testing activities, and checking procedures. It shall include equipment, labor, and schedule requirements for each activity.

Submit construction equipment data showing compliance with track gage, loads and clearances for on-track equipment.

Submit rail laying records as required by “Procedures for the Installation, Adjustment, Maintenance, and Inspection of CWR for South Branch Valley Railroad.”(CWR Procedures – SBVR).

**900.9.3-Inspections:** The Contractor and Engineer shall jointly walk the CWR in its unloaded location prior to beginning installation of the CWR.

The CWR installed during an authorized track outage period shall be inspected by the Supervisor of the contractor to assure that the CWR is fully spiked, rail temperatures measured and recorded, properly anchored, and properly joined with appropriate straight joint bars, or compromise joint bars, or welds to form a continuous line of rail. Adjacent strings may be joined by welds if the laid strings are anchored within the designated rail neutral temperature safe range.

Prior to returning the track to revenue service, the rail laid during each track outage shall be inspected by the Supervisor of the contractor, and a qualified SBVR employee. This

inspection is to be accomplished prior to returning the track to service to assure the safe passage of trains.

**900.9.4-Execution:** Unless specified otherwise herein, installation shall comply with AREMA Specifications.

All jointed rail, and OTM that has been removed from track shall be picked up, or removed from the ballast shoulders at the work site to facilitate ballast unloading.

The Contractor is to remove all bolt holes from rail before welding.

The Contractor shall only begin work during a track outage period installing the new CWR after authorization is received from the SBVR Employee-in-Charge (EiC) of Track Safety under the Roadway Worker Protection (RWP) of the Federal Railroad Administration (FRA).

The Contractor shall only remove the length of bolted rail that can be replaced with properly installed, and anchored CWR by the end of that authorized track outage period.

The Contractor shall pull the rail holding spikes, remove the bolted rail, plug the spike holes, and lay the new CWR in the existing plates. Then the Contractor shall spike every third tie to hold proper gage. Then all the ties shall be tamped to bring all of the ties tight to the bottom of the tie plate with the rail properly seated in each tie plate. Then the Contractor shall fully spike all of the ties.

As each string or portion of a string of CWR is laid and spiked, its Rail Temperature (RT) shall be noted, recorded as required by Chapter 3 Maintaining a Desired Rail Neutral Temperature Range, and noted on the Rail Installation Adjustment Report. Then the RT shall be compared to the Desired Rail Neutral Temperature (DRNT). The designated rail installation range is +/-20°F from the DRNT. The South Branch Valley Railroad DRNT is 95°F. Therefore, the designated Rail Neutral Temperature (RNT) safe range is between 75°F and 115°F.

If the RT is lower than the designated Rail Neutral Temperature (RNT), the temperature differential shall be calculated, and the required expansion is determined based on the temperature differential and the rail length. The rail shall then be uniformly expanded, and the CWR anchored. The actual length and expansion are then used to verify the new RNT. The adjustment details will be logged on the SBVR Rail Installation Adjustment Report and submitted to the Engineer at the end of each track outage period in which CWR was installed.

If the RT is higher than the designated rail installation range the installation must stop until the rail temperature returns within the range, or provisions for later readjustment must be made before the arrival of cold weather as required by the CWR Procedures – SBVR. The details of the RT being higher than the temperatures will be logged on the SBVR Rail Installation Adjustment Report and submitted to the Engineer at the end of each track outage period in which CWR was installed.

The Contractor shall anchor CWR after the CWR has been fully spiked, rail temperatures measured and recorded, proper adjustment made, if required, and recorded. The Contractor shall box anchor every tie for 195' in each direction from any joint. At that point the Contractor shall follow the Standard Box Pattern, box anchoring every other tie.

At the following locations the Contractor shall box anchor every tie for 195 feet in each direction from:

- a) Turnouts
- b) Rail Crossings
- c) Road Crossings

- d) Joints where CWR abuts Jointed Rail
- e) Severe Grades
- f) Sharp Curves

On ballast deck bridges the Contractor shall anchor CWR as listed in the sections above.

On open deck bridges, the Contractor shall anchor CWR as shown on “Track Standard Drawing Example Rail Anchor Patterns for CWR on Open Deck Bridges”, Page 33 of the CWR Procedures – SBVR.

The Contractor shall NOT apply anchors at locations where they will interfere with signal, or other track appliances, where they are inaccessible for adjustment or inspection, or on the rail opposite a joint.

The Contractor shall field weld adjacent strings of CWR together with thermite field welds. Before making the welds, any rail with bolt holes shall be removed.

**900.9.5-Method of Measurement:** The quantity to be paid for CWR shall be the lineal feet of CWR Installed as shown in the approved CWR Work Plan and accepted by the Engineer.

**900.9.6-Basis of Payment:**

**Alternate 1:** The Unit Price bid for this item shall be full compensation for furnishing all labor, materials, tools, and equipment necessary to remove and dispose of existing rail and Install the CWR as shown in the approved CWR Work Plan.

**Alternate 2:** The Unit Price bid for this item shall be full compensation for furnishing all labor, materials, tools, and equipment necessary to remove and stockpile the removed rail and Install the CWR as shown in the approved CWR Work Plan.

**900.10-INSTALL BALLAST AND SURFACE:**

This work shall not be performed until after the CWR has been laid, the released rail, and all scrap, and OTM have been removed from the CWR installation areas. It shall not proceed until after the Track Survey is completed, and a Proposed Track Centerline is reviewed, and accepted by the Engineer.

The work shall include the procurement and timely distribution of suitable ballast prior to surfacing the track as indicated in the Contractor prepared, and Engineer approved, Install Ballast and Surfacing Work Plan.

The surfacing of track shall include raising, aligning, and tamping the track and turnouts as indicated in the Contractor prepared, and Engineer approved, Install Ballast and Surfacing Work Plan.

**900.10.1-Materials:** Ballast used for this work shall be furnished by the Contractor, conform to AREMA Chapter 1, Part 2, Part 3, granite, or trap rock, that meet or exceed the recommended ballast gradations shown in Table 1-2-2.

**900.10.2-Submittals:** The Contractor shall submit an Install Ballast and Surfacing Work Plan for approval by the Engineer prior to beginning any procurement of ballast or surfacing the track for its Proposed Track Centerline.

The Contractor shall submit to the Engineer, for his review and approval, current certifications and test results verifying that the ballast from the proposed quarries conforms to AREMA Chapter 1, Part 2, Part 3, current issue, prior to purchase or delivery of the ballast.

The Contractor shall submit to the Engineer, for his review and approval, ballast unloading rail car and/or ballast unloading equipment data showing compliance with gage, loads, and clearances for on-track equipment on SBVR.

The Contractor shall submit to the Engineer, for his review and approval, planned ballast stockpiling locations and method(s) of delivery and unloading procedures to prevent segregation of the gradation of the ballast stockpiles.

The Contractor shall submit to the Engineer, for his review and approval, equipment data for ballast regulating and surfacing equipment showing compliance with gage, loads, and clearances for on-track equipment on SBVR.

The Contractor shall submit to the Engineer, for his review and approval, equipment data for the track raising, aligning, and tamping equipment certifying its ability to raise and align the track simultaneously prior to tamping each tie.

**900.10.3-Inspections:** The Engineer reserves the right to make unannounced quarry visits to verify compliance with the requirement of the specifications, obtain samples of stockpiled, or distributed ballast, and review prior inspections, delivery and handling methods, and review test results of current and previous ballast tests.

The Contractor shall demonstrate to the Engineer's satisfaction that the track ballast regulating, and track raising, aligning, and tamping equipment operates as intended in the field.

The Engineer reserves the right to make unannounced visits to the surfacing work site(s) to inspect the progress and quality of the work, and to reject unsatisfactory work, and require its remediation.

**900.10.4-Execution:** Ballast shall be procured by the Contractor and delivered in rail cars or trucks for distribution or stockpiling as determined in the Install Ballast and Surfacing Work Plan.

The distribution or stockpiling of ballast will be as outlined in the Install Ballast and Surfacing Work Plan.

The surfacing of track shall follow the distribution of ballast. Surfacing shall include raising, aligning, and tamping the track, grade crossings, and turnouts as indicated in the Contractor prepared, and Engineer approved, Install Ballast and Surfacing Work Plan.

After the track is surfaced, the ballast shall be regulated to fill the cribs between the ties level with the tops of the ties and provide a shoulder at the ends of the ties that conforms to the SBVR standard ballast section.

**900.10.5-Method of Measure:** Measurement of quantities of ballast shall be by the Ton as determined by individual weight tickets from ballast delivered by the truckload, and unloaded, or ballast delivered by rail car, and unloaded, and accepted by the Engineer.

Measurement of the track surface shall be by the Track Foot of track raised, aligned, surfaced, and accepted by the Engineer.

**900.10.6-Basis of Payment:** Payment for ballast purchased, delivered, and unloaded to raise, align, and surface track will be by weight tickets submitted, and the Contract price per Net Ton

Payment for track Surfacing will be by the Track Foot of track raised, aligned, and surfaced, and accepted by the Engineer.

**900.11-INSTALL RAIL SEAL:**

The work shall include the removal of existing grade crossing, pavement approaches, and jointed rail on the side being renewed. Following the installation of the CWR, the rubber rail seal shall be installed on the CWR, and the grade crossing surface replaced with suitable asphalt material. There are six (6) active at grade crossings within this project.

**900.11.1-Materials:** The rail seal system including the rail seal and fasteners to hold the rail seal product in place shall be one of the following systems or approved equal.

- a) Rail Seal from Iron Horse Engineering Company
- b) Rail Seal from HiRAIL
- c) Rail seal form Polycorp

The Asphalt shall meet WVDOH standards.

**900.11.2-Submittals:** The Contractor shall submit product data on the rail seal system for review and approval by the Engineer.

The Contractor shall, submit specifications for the asphalt to be used to repave the road crossing for review and approval by the Engineer.

The Contractor shall submit a Road Crossing Replacement Plan for each grade crossing to the Engineer for review and approval prior to beginning installation of CWR. The grade crossing plan shall include the following.

- a) Length and limits for Rail Seal installation.
- b) Pavement removal limits
- c) Pavement replacement limits and estimated tons of asphalt to be used.

**900.11.3-Inspections:** The Contractor shall inspect each road crossing, prior to submitting the Road Crossing Replacement Plan, for any discrepancies with the proposed installation of the CWR and rail seal.

**900.11.4-Execution:** The Contractor shall remove and if necessary, disassemble the existing crossing surface, pavement in the gage of the track, and pavement approaches of the grade crossing prior to the CWR being installed. The material removed shall become the property of the Contractor for his proper disposition offsite.

As the CWR may be laid on each side of the track through the crossing on separate days, the Contractor shall make provisions in the Road Crossing Replacement Plan to close the crossing for road traffic with the proper authority, remove the crossing surface to permit the installation of the CWR on one rail, then restore the crossing for road service. On a separate day the same crossing may need to be again closed for road traffic, the crossing surface removed to permit the installation of CWR on the opposite side of the track, and the crossing restored for road service another time.

Following the installation of the CWR, and before the road crossing surface is restored, the rubber rail seal shall be installed on the CWR. Rail Seal and Rail Seal clamps to be installed per manufacturer's specifications. Rail seal must extend a minimum of 4 feet beyond the roadway travelled way. The rail seal must bear firmly against the rail and be free of any dirt or foreign matter when installed. Rail Seal clamps must be installed within in each crib and at the ends of the rubber rail seal to ensure the rubber rail seal is secured to the rail. Heavy Tape (such as duct or Gorilla) should be placed on the seam between top of rail and rail seal to cover existing gap prior to paving.

The road crossing surface may need to be removed on a separate occasion, to permit the raising, aligning, and tamping of the track to meet the requirements of the Proposed Track Centerline and the Install Ballast and Surfacing Work Plan.

Asphalt shall be laid between the existing road surface and the rail. That area shall be leveled and free of all foreign material (mud, dirt, trash, etc.). Existing road surface should be milled to eliminate poor existing conditions.

Asphalt base material should be placed in the gage of the track in at least 2 equal lifts and each lift compacted.

Asphalt surface material may be placed in 1 lift and compacted to height of top of rail. A key edge shall be made, and tack applied to existing road surface. A minimum of 20' runoff should be included for all traffic directions. Final roadway surface shall not allow standing water, seams must be thoroughly rolled, and edges compacted tight. Asphalt to extend and wrap around outer edges of rail seal. All excessive or extra asphalt must be properly disposed of offsite by contractor.

Existing signage at the crossing shall be protected from damage, or removed and replaced after all work is completed at the crossing. Crossbucks and other signage shall be installed to manufacturers specification and in accordance with FRA and MUTCD guidelines. Required signage, if applicable, will be defined at the pre-bid conference.

The Contractor shall have 24 hours to complete work of an individual at grade crossing.

**900.11.5-Method of Measurement:** The work to be measured for payment under this item shall be actual number of linear feet of Rail Seal, measured along the rail installed and accepted by the Engineer.

The work to be measured for payment under this item shall be actual number of tons of asphalt, installed and accepted by the Engineer.

**900.11.6-Basis of Payment:** The Unit Price bid for this item shall be full compensation for furnishing all labor, materials, tools and equipment necessary to furnish, deliver, and complete the work of Rail Seal, as required to perform the work.

The Unit Price bid for this item shall be full compensation for furnishing all labor, materials, tools and equipment necessary to remove and properly dispose of the existing pavement, furnish, deliver, and install the pavement as required to perform the work and the rail seal installation instructions.

#### **900.12-CONTRACTOR DELAY DAYS**

When work is not able to be performed because of an unplanned railroad operation on a day or period of days the contractor will be compensated, for the delay.



**900.12.1-Submittals:** Submittals for Contractor Delay Days must include what days what will be impacted and when the days will occur during the build schedule.

Submittals for Contractor Delay Days must be sent within 10 days of occurrence.

**900.12.2-Execution:** Contractor Delay Days will be paid in 1/8-day increments.

There must be a 30-minute delay before claiming the first 1/8-day payment, less than that will result in no payment for the delay.

Any delay scheduled 2 weeks in advance is not eligible for contractor delay day.

**900.12.3-Method of Measurement:** Payment for Contractor Delay Days will be based on the actual number of delay days incurred by the contractor in 1/8-day increments.

**900.12.4-Basis of Payment:** The payment shall include all labor and equipment costs incurred by the contractor for a delay day.

**900.13-PAY ITEMS:**

ITEM	DESCRIPTION	UNIT
9000005-001	Miscellaneous Railroad, Surveying	Lump Sum
9000005-002	Miscellaneous Railroad, CWR Material	Linear Foot
9000005-003	Miscellaneous Railroad, CWR Install Alternate 1	Linear Foot
9000005-003	Miscellaneous Railroad, CWR Install Alternate 2	Linear Foot
9000005-004	Miscellaneous Railroad, Ballast	Ton
9000005-004	Miscellaneous Railroad, Track Surfacing	Track Foot
9000005-005	Miscellaneous Railroad, Rail Seal	Linear Foot
9000005-005	Miscellaneous Railroad, Asphalt	Ton
9000005-006	Miscellaneous Railroad, Contractor Delay Days	Day