20211201 - December's Specifications Committee Meeting

December Specifications Committee Meeting Agenda

Meeting Date

Wednesday, December 1, 2021 @ 9:00am

Google Meet video conference. E-mail distribution message includes instruction.

Approved Permanent Specification changes from last Committee meeting (10/6/21)

- **Section 201-Clearing and Grubbing** Updated to clarify the sections requirements.
- **307.9.1-Price Adjustment** Revises Table of contract price adjustment for gradation not within specs.
- **601.3.1-Mix Design Requirements, 601.3.2.4.-Total Solids A, and 601.3.2.4.1-Optimized Aggregate Gradation** Gives Contractor option to use a reduced target cement factor provided the aggregates used in those mix designs meet the requirements for optimized aggregate gradation.
- **601.5.5-Bridge Deck Placing and Finishing Equipment & 601.10.4-Placing Concrete Bridge Decks** Adds equipment requirements to finishing of Class H bridge decks.
- **Section 633-Concrete Gutter and Dumped Rock Gutter** Update sections requirements.
- **Section 405-Chip Seals It is a complete rewrite.** Update to AASHTO spec and industry standards.
- **603.6.4.1-Acceptance Testing of Class S-P Concrete** Modify acceptance testing frequency for SCC.
- **605.5-Basis of Payment** Adds positive drainage requirements during construction to inlets and structures.
- **Section 606-Underdrains** Removes outdated language and to more in line with Standard Sheet DR8.
  - **714.20-PVC Underdrain Pipe** Removes semicircular pipe reference and adds PVC underdrain pipe
- **712.10-Coated Steel Barbed Wire** Removes the invalid reference AASHTO reference.

Approved Project Specific Special Provisions (SP) from last Committee meeting (10/6/21)

- **SP690-Cross Slope and Superelevation Tolerances**
- **SP107-Environmental Commitment and Mitigation**
- **SP601 - Super Air Meter**
- **Two Project Specific Special Provision for streetscape elements.**
  - **SP660-Rectangular Rapid Flashing Beacon Assembly**
  - **SP663 - Stamped Asphalt Coating System**
- **SP642-Compost Filter Socks**

Items removed from Committee Agenda

- **None**

Old Business - Provisions discussed at last Committee meeting

SECTION	TITLE	DESCRIPTION
410	**Section 410-Aphalt Base and Wearing Courses, Percent Within Limit (PWL)** Champion: C. Miller, JF Allen	**6th time to Committee. Discussed in February, April, June, August & October.** Proposed specification change to Section 410. This specification suggestions is from Industry (Asphalt Association of WV). It is redline copy showing the proposed changes. No update to the specification; it is redline copy showing the proposed changes. Approval is expected in December.

663	**SP663-Bicycle Lane Background Markings, Type V** M. Perry, Stantec	**4th time to Committee. Discussed in June, August, & October.** Project Specific Special Provision for Bicycle Lane, Background Markings, Type V. The provision utilizes green thermoplastic markings for background markings in designate bicycle lane to highlight lane separation and bike users on streetscape projects. Provision has been updated per comments at the last meeting; it is redline copy showing the revisions. Approval is expected in December.
601	**SP601-Ultra High Performance Concrete** A. Mongi	**Update to previously approved SP. 2nd time to Committee. Discussed in October.** Project Specific Special Provision on UHPC. The revision updates the material, submittal, and constructions methods requirements. Provision has been updated per comments at the last meeting; it is redline copy showing the revisions.
207	**SP207-Settlement Plate** A. Mongi	**2nd time to Committee. Discussed in October.** Project Specific Special Provision on Settlement Plate. The device is installed on project to monitor/measures settlement of a placed embankment. No update to the provision.
420	**Section 420** V. Allison	**2nd time to Committee. Discussed in October.** Specification changes to Section 420, it is a complete rewrite. The update is to make the spec more in line with AASHTO spec and industry standards. Specification has been updated per last meeting; it is redline copy showing the proposed changes. Approval is expected in December.
503 **507**	**Section 503-Sealing Cracks in Concrete Pavement** **Section 507-Large Crack and Pothole Repair of Concrete Pavement** S. Boggs	**2nd time to Committee. Discussed in October.** Two specification changes related to crack width repair of concrete pavement. 1. Section503-Sealing Cracks in Concrete Pavement 2. Section 507-Large Crack and Pothole Repair of Concrete Pavement The revision updates terminology and clarifies when each section should be used for repair. The specifications are redline copy showing the proposed changes. No update to the specifications. Approval is expected in December.

601 **628**	**SP601-Grout Injection** **SP628-Exploratory Drilling** T. Priddy	**2nd time to Committee. Discussed in October.** Two Project Specific Special Provision to located large void in areas of proposed structure and to fill these voids, if encountered. 1. SP 601-Grout Injection 2. SP628-Exploratory Drilling Provision has been updated per comments at the last meeting; they are redline copy showing the changes. Approval is expected in December.
604	**604.12.3-Testing of Pipe** A. Gillispie	**2nd time to Committee. Discussed in October.** Specification changes to Section 604-Pipe Culverts. The revision clarifies that the testing is to be performed when both requirements are met. No update to the specification; it is redline copy showing the proposed changes. Approval is expected in December.
607	**607.1-Description** S. Boggs	**2nd time to Committee. Discussed in October.** Specification changes to Section 607-Guardrail. The revision removes modified Cut Slope Terminal paragraph, as the same information is in 607.7 of the specifications. No update to the specification; it is redline copy showing the proposed changes. Approval is expected in December.
607	**SP607-TL-5 Guardrail System** J. Hall	**2nd time to Committee. Discussed in October.** Project Specific Special Provision for MASH TL-5 Longitudinal Guardrail System. No update to the provision. Approval is expected in December.
610	**Section 610-Curbs, Combination Curbs and Gutters, and Medians** S. Boggs	**2nd time to Committee. Discussed in October.** Specification changes to Section 610-Curbs, Combination Curbs and Gutters, and Medians The update removes reflective concrete curbing and resetting curb items, updates median barrier item, and adds item for raised concrete traffic island. The specification has been updated per comments at the last meeting; it is redline copy showing the proposed changes with newest changes highlighted yellow. Approval is expected in December.

623	**Section 623-Pneumatically Applied Mortar or Concrete (Shotcrete)** M. Perrow	**2nd time to Committee. Discussed in October.** Specification changes to Section 623-Pneumatically Applied Mortar or Concrete (Shotcrete) The update clarify the requirements. The specification has been updated per comments at the last meeting; it is redline copy showing the proposed changes with newest changes highlighted yellow. Approval is expected in December.
636	**636.23.23-Temporary Traffic Signal or Temporary Lighting and 636.25-Pay Items** S. Boggs	**2nd time to Committee. Discussed in October.** Specification changes to Section 636-Maintaining Traffic. The update clarify the temporary traffic signal requirements. The specification has been updated per comments at the last meeting; it is redline copy showing the proposed changes. Approval is expected in December.
659 **662** **715**	**659.2.2-Conduit** **662.2.3.3-Type H (High Density Polyelthenyne), 662.15.1-Conduit, and 662.17-Pay Items** **715.42.10.4-Type H (High Density Polyelthenyne)** J. Sizemore	**2nd time to Committee. Discussed in October.** Three specification changes adding Type H (High Density Polyelthenyne) conduit. 1. Section 659-Sign Lighting, subsection 659.2.2-conduit 2. Section 662-Roadway Lighting, subsections 662.2.3.3-Type H (High Density Polyelthenyne), 662.15.1-Conduit, and 662.17-Pay Items 3. Section 715-Miscellaneous Materials, subsection 715.42.10.4-Type H (High Density Polyelthenyne) No update to the specification. The specifications are redline copy showing the proposed changes. Approval is expected in December.
659 **660** **662** **715**	**659.2.1-Electrical Material Docum. and Certification** **660.1-Description and 660.2-Materials** **662.2.1-Electrical Material Docum. and Certification** **715.43-Electrical Material Compliance Documentation and Certification** J. Sizemore	**2nd time to Committee. Discussed in October.** Three specification changes adding electrical material & certification requirements. 1. Section 659-Sign Lighting, subsection 659.2.1-Electrical Material Documentation and Certification 2. Section 660-Traffic Signals, subsections 660.1 and 660.2-materials 3. Section 662-Roadway Lighting, subsection 662.2.1-Electrical Material Documentation and Certification 4. Section 715-Miscellaneous Materials, subsection 715.43-Electrical Material Compliance Documentation and Certification No update to the specification. The specifications are redline copy showing the proposed changes. Approval is expected in December.

691	**SP691-High Velocity Texturing** B. Whelan	**2nd time to Committee. Discussed in October.** Project Specific Special Provision for High Velocity Texturing. The provision has been updated; it is redline showing the changes. Approval is expected in December.
715	**715.14.2-Approval for Bearing Pads Without Shims** D. Simmons	**2nd time to Committee. Discussed in October.** Specification changes to Section 715-Miccellaneous Materials. The revision adds NTPEP testing bearing pad approval requirements for bearing pads without shims or internal stiffeners. No update to the specification; it is redline copy showing the proposed changes. Approval is expected in December.
611 **612** **621** **622** **632** **656** **665** **689**	**Section 611-Precast Concrete Traffic Directors** • **715.20-Precast Concrete Traffic Directors** **Section 612 - Tunnel Liner Plate Pipe** **Section 621 - Steel Grid Flooring** **Section 622 - Timber Bridge Structures** **Section 632 - Horizontal Drains** **Section 656 - Seedling Planting** • **715.34-Seedling Plants** **Section 665 - Plugging Gas, Oil, and Drilled Water Well** **Section 689 - Metalizing Steel** S. Boggs	**2nd time to Committee. Discussed in October.** Removal of several sections of the spec book that have had minimal contract use in the past 12 years and no recent updates to their associated sections. The sections are listed below, as well as their number of contract occurrences in the past 12 years: 1. Section 611 - Precast Concrete Traffic Dividers Item 611001-001 for 'Precast Concrete Traffic Dividers' which has 2 occurrences in past 12 years (for permanent installation of temporary concrete barrier on truck escape ramp project at same location); however we used to have a Standard Detail for this which has been removed from standards and is for something entirely different than temporary concrete barrier for which it was used. a. 715.20-Precast Concrete Traffic Dividers 2. Section 612 - Tunnel Liner Plate Pipe Item 612001 has 2 occurrences in the past 12 years. 3. Section 621 - Steel Grid Flooring Items 621001 & 621002 have 0 occurrences in the past 12 years. 4. Section 622 - Timber Bridge Structures The twelve items listed in the spec book have 0 occurrences in the past 12 years. 5. Section 632 - Horizontal Drains Items 632001, 632002, & 632003 have 0 occurrences in the past 12 years. 6. Section 656 - Seedling Planting Item 656001 has 1 occurrence in the past 12 years. a. 715.34-Seedling Plants 7. Section 665 - Plugging Gas, Oil, and Drilled Water Well Item 665001, 665002, & 665003 have 0 occurrences in the past 12 years. 8. Section 689 - Metalizing Steel Items 689001, 689002, & 689003 have 0 occurrences in the past 12 years. Each of the provisions would be made into a project specific special provision (SP), which would allow for their future use, if needed. A copy of these provision follow; the SPs have been updated and are redline copy showing the revision to existing spec. Approval is expected in December.

102 **103** **108** **109**	**102.1-Eligibility of Bidders, 102.5.3-Notice to Contractors, 102.5.4-Bid Bond, 102.6-Proposal Guaranty, & 102.12-Irregular Proposals** **103.1-Consideration of Proposals, 103.5-Return of Proposal Guaranty, & 103.6-Requirements of Contract Bond,** **108.1-Subletting of Contract** **109.6-Partial Payments** S. Danberry	**2nd time to Committee. Discussed in October.** Four specification changes updating prequalification process. 1. Section 102-Bidding Requirements and Conditions, Subsections 102.1-Eligibility of Bidders, 102.5.3-Notice to Contractors, 102.5.4-Bid Bond, 102.6-Proposal Guaranty, & 102.12-Irregular Proposals 2. Section 103-Award and Execution of Contract, Subsections 103.1-Consideration of Proposals, 103.5-Return of Proposal Guaranty, & 103.6-Requirements of Contract Bond, 3. Section 108-Prosecution and Progress, Subsection 108.1-Subletting of Contract 4. Section 109-Measurement and Payment, Subsection 109.6-Partial Payments The specifications are redline copy showing the proposed changes; highlighted areas show changes/updates from the last meeting, which were reviewed/discussed at the last meeting. Approval is expected in December.

New Business - New Provisions for Spec Committee

SECTION	TITLE	DESCRIPTION
613	**SP613-Spray Applied Pipe Liner** A. Gillispie	**Update to previously approved SP. 1st time to Committee.** Project Specific Special Provision on Spray Applied Pipe Liner. The revision updates the material and testing requirements. The provision is redline copy showing the revisions.
703	**703.1.1-General Requirements** R. Shuman	**1st time to Committee.** Specification change to Section 703-Course Aggregates. The revision is to assure the aggregates provided by any source are not contaminated or mixed with any undeclared materials. The specification is redline copy showing the revisions.
709	**709.1-Steel Bars for Concrete Reinforcement** D. Lipscomb	**1st time to Committee.** Specification change to Section 703-Course Aggregates. The revision is to assure the aggregates provided by any source are not contaminated or mixed with any undeclared materials. The specification is redline copy showing the revisions.

Comments

Comments are requested on these Specifications Changes and Project Specific Special Provisions.

Please share your comments by **November 29, 2021**, they help in the decision making process.
Please Send Comments to: DOHSpecifications@wv.gov

Deadline for new items & updates to these provision is January 7, 2022.

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, **February 2, 2022 at 9:00 a.m.**
Meeting will be held virtually via Google Meet. If in-person meeting is available, information will provided (meeting invite will include details).

2017 Standard Specification Roads and Bridges & 2021 Supplemental Specifications

Electronic Copy (pdf): The 2017 Standard Specifications Roads & Bridges & 2021 Supplemental Specifications can be viewed, printed, or downloaded from the Specifications Website. A link to the Specifications pages is here: http://transportation.wv.gov/highways/contractadmin/specifications

Print Version: Hard copies of the 2017 Standard Specifications Roads and Bridges & 2021 Supplemental Specifications are available thru Contract Administration. An order form for the book is on Specifications Website. A link to the page is here:
http://transportation.wv.gov/highways/contractadmin/specifications

2022 Supplemental Specifications

2022 Supplemental will go into effect on all projects let after 1/1/22. It will be posed on the specifications webpage around mid-December. Hard copy will be available in early 2022.

2022 Specifications Committee

The Specification Committee typically meet every other month; on the first Wednesday. 2022 meetings will be held in February (2/2), April (4/6), June (6/1), August (8/3), October (10/5), and December (12/7).
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
http://transportation.wv.gov/highways/contractadmin/specifications

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 DOHSpecifications@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 WVDOT 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 BUSINSESS 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 410
ASPHALT BASE AND WEARING COURSES, PERCENT WITH LIMITS (PWL)

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

410.1-DESCRIPTION:

410.1.1-General: The Contractor shall note that this Section is to be used for Square Yard Paving operations; however, the proposal and / or plans may contain 401 and 402 items to be paid and measured by the Ton (TN). In instances where those items occur, they shall be constructed and measured in accordance with the applicable sections of the West Virginia Division of Highways Standard Specifications Roads and Bridges, current edition, and the Supplemental Specifications current when the contract is let.

Additionally, the following Materials Procedures (MP's) for Square Yard Paving ~~may~~ can be ~~obtained by contacting~~ found on the Materials Control, Soils and Testing (MCS&T) Division website: https://transportation.wv.gov/highways/mcst/Pages/WVDOH-Materials-Procedures.aspx

a. MP 401.02.31 QC & Acceptance
b. MP 401.07.20 Sampling Loose Asphalt Pavement Mixtures
c. MP 401.07.21 Sampling Compacted Asphalt
d. MP 401.07.22 Thickness of Asphalt Concrete Using Cores
e. MP 401.07.23 Bond Strength
f. MP 401.07.24 Pavement Macrotexture
g. MP 401.07.25 Evaluation of Asphalt Pavements
h. MP 401.13.50 Determination of PWL

410.1.2-PWL Paving Description: This work shall consist of constructing one or more courses of asphalt, mixed mechanically in a plant, composed of aggregate and asphalt material designed in accordance with either the Marshall or Superpave Design System as specified in the contract documents, on a prepared foundation in accordance with these specifications and in ~~reasonable~~reasonably close conformity with the lines, grades, weights or thicknesses, and cross sections shown on the Plans or established by the Engineer.

The unit of measurement for asphalt will be by the ton ~~(megagram)~~, square yard ~~(square meter)~~, or cubic yard ~~(cubic meter)~~.

The work will be accepted in accordance with these Specifications and the applicable requirements of Sections 105, 106, and 109.

410.2-MATERIALS:

The materials shall conform to the following requirements:

MATERIAL	SUBSECTION
Coarse Aggregate	703.1 thru 703.3 Note 1 & Note 2 (See MP 401.02.28 for exceptions and additions required for Superpave Items.)
Fine Aggregate	702.3 (See MP 401.02.28 for additions required for Superpave Items)
Mineral Filler	702.4
Performance Graded Binders	705.5

Note 1 The total shale, coal and other lightweight deleterious material and friable particles shall not exceed 3%.

Note 2 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.

410.2.1-Performance Graded Binder Grade: The standard grade for Performance Graded (PG) binders shall be PG 64S-22, any deviation will be noted in the contract documents. PG 64H-22 shall be used on projects specified with over 20 million ESALs over the design life. PG 64S-22 binder may be used in asphalt placed below the top two lifts in any pavement section, scratch course and patching-and-leveling are not identified as lifts.

CONSTRUCTION METHODS

410.3-GENERAL:

Construction methods to be used in performing the work shall be submitted to the Engineer for review prior to the start of work. This review may require modification of the proposed methods to provide the desired end product. All equipment, tools, machinery, and plant shall be maintained in a satisfactory working condition.

410.4-COMPOSITION OF MIXTURES:

410.4.1-General: The aggregate for use in the designated mixture shall consist of a mixture of aggregate (coarse, fine, reclaimed asphalt pavement (RAP) if desired, or mixture thereof) and mineral filler if required. It shall be the responsibility of the Contractor to determine the percentage of RAP to be used in the mix. The amount and grade of virgin PG Binder to be used in the RAP designs shall be determined in accordance with Materials Procedure (MP) 401.02.24 and MP 401.02.28.

410.4.2-Job Mix Formula: Job Mix Formula (JMF) is the specification for a single mix produced at a single plant. This mix may be specific to a single project or be used on multiple projects if the basic design criteria (design compaction level and PG Binder grade) are the same.

The Contractor shall submit a proposed JMF for each combination of aggregate and asphalt material for each asphalt mixture to be produced. Depending on the design type, the JMF gradations shall be within the tolerances set forth in either Table 410.4.2A or Table 410.4.2B. Marshall mix designs shall be developed in accordance with MP 401.02.22. Superpave mix designs shall be developed in accordance with MP 401.02.28.

Each proposed JMF must be documented on the Division Form T400 or T400SP and the entire JMF package shall be forwarded for review to the District Materials Engineer/Supervisor. After the District reviews the T400/T400SP and JMF package shall then be transmitted to the Materials Control, Soils and Testing Division for final review. If the JMF requires revision, it will be returned to the designer through the District. The T400/T400SP Form shall contain the following information:

i. Identification of the source and type of materials used in the design.
ii. The aggregate blend percentages and the percentage for each sieve fraction of aggregate considered the desirable target for that fraction.
iii. The percentage of virgin asphalt binder to be blended with RAP and the total asphalt binder representing the optimum asphalt content for the JMF submitted, which is to be considered the desirable target percentage.
iv. The temperature of the completed mixture at the plant which shall be within ± 25° F ~~(± 14° C)~~ of the median mix temperature established by the temperature-viscosity chart or as recommended by the asphalt supplier.
v. The ratio (calculated to the nearest one-tenth percent) of the Fines to Asphalt (FA). For Marshall mixes the ratio is defined as the percentage of aggregate passing the No. 200 (75 µm) sieve, divided by the percentage of asphalt content calculated at the percentage optimum asphalt content of the design. For Superpave mixes the ratio is defined as the percentage of aggregate passing the 75 µm (No. 200) sieve, divided by the percentage of effective asphalt content calculated at the percentage optimum asphalt content of the design.

TABLE 410.4.2A
Design Aggregate Gradation Requirements for Marshall Mix Designs

Type of Mix	Base-I	Base-II (Patch & Level)	Wearing IV	Wearing-I (Scratch-I)	Wearing-III (Scratch-III)
Sieve Size	Nominal Maximum Size				
	1 ½ in (37.5 mm)	¾ in (19 mm)	¾ in (19 mm)	3/8 in (9.5 mm)	No. 4 (4.75 mm)
2 in (50 mm)	100	–	–	–	–
1 ½ in (37.5 mm)	90-100	–	–	–	–
1 in (25 mm)	90 max	100	100	–	–
¾ in (19 mm)	–	90-100	90-100	–	–
½ in (12.5 mm)	–	90 max	90 max	100	–
3/8 in (9.5 mm)	–	–	–	85-100	100
No. 4 (4.75 mm)	–	–	47 min	80 max	90-100
No. 8 (2.36 mm)	15-36	20-50	20-50	30-55	90 max
No. 16 (1.18 mm)	–	–	–	–	40-65
No. 30 (600 µm)	–	–	–	–	–
No. 50 (300 µm)	–	–	–	–	–
No. 200 (75 µm)	1-6	2-8	2-8	2-9	3-11

TABLE 410.4.2B
Design Aggregate Gradation Requirements for Superpave Mix Designs

Type of Mix	37.5	25	19 Note 1 (Patch & Level)	12.5	9.5 (Scratch)	4.75 (Scratch)
Sieve Size	Nominal Maximum Size					
	37.5 mm (1 ½ inch)	25 mm (1 inch)	19 mm (3/4 inch)	12.5 mm (1/2 inch)	9.5 mm (3/8 inch)	4.75 (No. 4)
50 mm (2”)	100	–	–	–	–	–
37.5 mm (1½”)	90-100	100	–	–	–	–
25 mm (1”)	90 max	90-100	100	–	–	–
19 mm (3/4”)	–	90 max	90-100	100	–	–
12.5 mm (1/2”)	–	–	90 max	90-100	100	100
9.5 mm (3/8”)	–	–	–	90 max	90-100	95-100
4.75 mm (No.4)	–	–	–	–	90 max	90-100
2.36 mm (No.8)	15-41	19-45	23- 49	28-58	32-67	
1.18 mm (No.16)	–	–	–	–	–	30-60
600 µm (No.30)	–	–	–	–	–	–
300 µm (No. 50)	–	–	–	–	–	–
75 µm (No.200)	0-6	1-7	2-8	2-10	2-10	6-12

Note 1 When a 19 mm mix is specified for use as a heavy-duty surface mix, it shall be designed as a fine graded mix with the additional requirement of a minimum of 47% passing the 4.75 mm (No.4) screen.

If it becomes necessary to change aggregate sources, a new mix design shall be developed and submitted for approval. When using neat (unmodified) PG Binders, the binder grade must always remain the same for each design, however the binder source may be changed without requiring a new mix design given that the replacement binder is provided from an approved source. If a source change results in the use of an additive enhanced modified binder of the same grade, a new mix design will be required.

If a modified binder source is changed or if the modification process is changed, a new mix design shall be developed and submitted for approval. A source change to a new location with the original manufacturer/supplier and the original modification process will not require a new mix design.

At no time shall different grades of PG Binders be mixed together in the same storage tank. When it is necessary to switch to a new binder grade the tank shall be drawn down as far as possible, normally to the top of heating coils, before refilling with the new binder. The new binder shall be circulated thoroughly before restarting production.

410.4.2.1-Warm Mix Asphalt: When the Contractor chooses to use an approved asphalt design to be produced as warm-mix asphalt (WMA) using the water injection system, the temperature of the completed mixture at the plant may be lowered to an established range that has previously been determined through trial production. The allowable temperature range specified on the approved T400 mix design form shall be adjusted accordingly when producing WMA. In addition, all references to the minimum compaction temperatures in Sections 410.10.3 and 410.10.4 of this specification, may be

waived if it can be established that additional density can be obtained at lower temperatures without damaging the pavement. All testing requirements established for Hot Mix Asphalt mix designs and quality assurance/quality control testing shall also apply to WMA.

410.5-TESTING:

410.5.1-Test Methods:

MP 700.00.06	Aggregate Sampling Procedures
AASHTO T168	Sampling Hot-Mix Asphalt
AASHTO T11	Materials Finer than No. 200 (75 µm) Sieve in Mineral Aggregates by Washing
AASHTO T27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T30	Mechanical Analysis of Extracted Aggregate
AASHTO T164	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
AASHTO T308	Asphalt Content of HMA by the Ignition Method (Test Method A)
AASHTO T245	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D5581	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (For Base-I Marshall designs only)
AASHTO T166	Bulk Specific Gravity of Compacted Bituminous Mixtures
AASHTO T209	Maximum Specific Gravity of Bituminous Paving Mixtures
AASHTO T312	Determining the Density of HMA Specimens by Means of the Superpave Gyratory Compactor
AASHTO T331	Bulk Specific Gravity and Density of Compacted HMA Using Automatic Vacuum Sealing Method
ASTM D7227	Rapid Drying of Compacted Asphalt Specimens Using Vacuum Drying Apparatus
MP 401.02.31	Quality Control and Acceptance of Asphaltic Mixtures
MP 401.07.20	Sampling Loose Asphaltic Mixtures in the Field
MP 401.07.21	Sampling Compacted Asphaltic Mixtures in the Field
MP 401.07.22	Measuring Thickness of Asphalt Pavement using Drilled Cores
MP 401.07.23	Measuring Bond Strength of Cored Specimens
MP 401.07.24	Measuring Asphaltic Pavement Macrotexture
MP 401.07.25	Evaluation of Pavement with Substandard Properties
MP 401.13.50	Determination of Percent Within Limits

410.6-CONTRACTORS QUALITY CONTROL:

410.6.1-Quality Control Testing: Quality control of the asphalt pavement is the responsibility of the Contractor. The Contractor shall maintain equipment and qualified personnel including at least one certified Asphalt Plant Technician at each plant. The technician shall be in charge of all plant quality control activities such as mix proportioning and adjustment and all sampling and testing activities necessary to maintain the various properties of asphalt within the limits of the specification.

The Contractor shall maintain necessary equipment and qualified personnel including at least one certified Asphalt Field and Compaction Technician at each project during paving operations. Additionally, a certified Asphalt Field and Compaction Technician with certification to perform nuclear density testing of asphalt pavements shall perform all testing

necessary to assure compaction of the asphalt meets specification requirements. ~~Compaction Technicians may serve as Asphalt Field and Compaction Technicians for asphalt compaction testing until December 31, 2017.~~

410.6.2-Job Mix Formula Field Verification: For each JMF, a mix design field verification shall be conducted during the first days of plant production. For Marshall and Superpave designs, the verification shall be in accordance with the guidelines established in MP 401.02.31. The field verification is for the purpose of demonstrating that the JMF can be produced within the specified tolerances set forth in the MP 401.02.31. If the mix cannot be produce within these requirements, a new mix design will be required.

410.6.3-Quality Control Testing Requirements: After the JMF design field verification has been successfully completed, sampling frequency and test requirements for quality control shall be as set forth in MP 401.02.31 for Marshall and Superpave designs. If the Division determines that a mix cannot be consistently produced within the tolerance limits of the specified design properties, approval of the mix may be revoked and the contractor will be required to provide a new mix design.

410.7-ACCEPTANCE TESTING:

410.7.1-Acceptance Testing of Asphalt: For Interstates and divided NHS Highways, material from the paving of the traveled lanes and shoulders will be accepted in the field on a lot-by-lot basis. Lots will be established cumulatively and will be specific for each JMF. Each lot consists of five equal sublots (n=5). A completed sublot will have cores obtained for Pavement Density, and Bond Strength and a Loose Mixture sample for gradation and asphalt content. Samples for mat density and bond strength shall also be used to measure lift thickness prior to any preparation for density or bond strength. All field samples shall be obtained from locations determined as per MP 401.07.20 and MP 401.07.21.

A normal lot size is 2,500 tons with five, 500-ton sublots (n=5), unless operational conditions or project size dictate otherwise. If operational conditions or project size dictate, readjustment of the lot will be made as specified in Table 410.7.1. Breakdowns or stoppages of short periods due to such causes as weather or equipment failure will not be considered as reason to adjust the lot size. The original lot will be continued when work resumes after stoppages of less than 5 days. If a lot is terminated due to a stoppage of 5 days or more, adjust the lot size and number of sublots as specified in Table 410.7.1.

For two lane and non-divided NHS Routes, refer to Section 410.13.7.1.

TABLE 410.7.1

Re-adjustment of Lot Size and Associated Number of Sublots Remaining Quantity Following Last Full Lot	**Action**
Less than 500 tons without a combination of one mixture acceptance sample and one density core	Quantity combined with the previous lot, (n=5)
Less than 500 tons with a combination of one mixture acceptance sample and one density core	One new sublot defined and quantity combined with the previous lot, (n=6)
500 tons to less than 1,000 tons without a combination of two mixture acceptance samples and two density cores	One new sublot defined and quantity combined with the previous lot, (n=6)
500 tons to less than 1,000 tons with a combination of two mixture acceptance samples and two density cores	Two new sublots defined and quantity combined with the previous lot, (n=7)
1,000 tons to less than 1,500 tons without a combination of three mixture acceptance samples and three density cores	Two new sublots defined and quantity combined with the previous lot, (n=7)
1,000 tons to less than 1,500 tons with a combination of three mixture acceptance samples and three density cores	New lot defined, (n=3)
1,500 tons to less than 2,000 tons without a combination of four mixture acceptance samples and four density cores	New lot defined, (n=3)
1,500 tons to less than 2,000 tons with a combination of four mixture acceptance samples and four density cores	New lot defined, (n=4)
2,000 tons to less than 2,500 tons without a combination of five mixture acceptance samples and five density cores	New lot defined, (n=4)
2,000 tons to less than 2,500 tons with a combination of five mixture acceptance samples and five density cores	New lot defined, (n=5)

Immediately after each sample is taken, it shall be identified by labeling or otherwise with the following information:

1. Contract ID
2. State Project Number
3. Sample Type (density, bond, loose, etc.)
4. Pavement Course (surface, base)
5. Lot Number
6. Sublot Number
7. Date
8. Sampled By

A sample labeling standard is shown in MP 401.07.20 Sampling of Loose Asphaltic Pavement Mixtures and MP 401.07.21. Upon fully identifying, marking, or labeling, and securing, samples shall be transported to the District Materials Laboratory for testing unless otherwise indicated in the proposal.

410.7.1.1-Mixture Acceptance Samples. The Inspector will select sample locations in each sublot according to MP 401.07.20 Sampling of Loose Asphaltic Pavement Mixtures. The Inspector or in the presence of the Inspector, one loose mixture sample shall be obtained for each sublot. This sample is to be taken directly from the uncompacted mixture and immediately processed in accordance with the MP.

410.7.1.2-Compaction: Compaction testing for mat density shall be performed for all traveled lanes, ramps and shoulders. Work will be evaluated based on an Upper Specification Limit (USL) of ~~97.0~~ 98.0 and a Lower Specification Limit (LSL) of 91.5 for all mats within travel lanes. Acceptance of mat density shall be in accordance with 410.13.3.

Maximum density values that are supplied by the asphalt producer shall be verified by the District Materials staff by determining the theoretical maximum specific gravity in accordance with AASHTO T209 Theoretical Maximum Specific Gravity (Gmm). This verification of Gmm shall be conducted once per lot for all mixes, or one in each five reported values from the asphalt producer. This Gmm value must be within 0.024 of the asphalt producer's daily average. Any deviation of greater shall warrant special evaluation. Joint density testing is required. The joint density shall be evaluated based on a Lower Specification Limit (LSL) of 89% of a maximum density established by averaging the maximum densities for the paved mats adjacent to the constructed longitudinal joint. The joint density requirement shall only apply to the surface lift of the pavement structure. Lots for joint density shall also be established cumulatively and laid out as per the applicable provisions within MP 401.07.21.

A normal lot size for evaluation of joint density is 10,000 linear feet of constructed joint with five, 2000 foot long sublots, unless operational conditions or project size dictate otherwise. Lots for joint density determined to be 4000 feet in length or less shall be incorporated into the previous full lot. If the length is 2000 feet or less, then one sample shall be taken, and the lot be evaluated with six samples (n=6). If the length is greater than 2000 feet, then ~~and~~ two samples shall be taken, and the lot be evaluated with seven samples (n=7). Lots for joint density that are greater than 4000 feet in length shall have samples taken representative of each 2000-foot long sublot or portion thereof.

Acceptance for joint density shall be as per 410.13.4.

Patching-and-leveling and scratch courses shall not be included in determining the total new pavement thickness to be tested for compaction. When asphalt is placed in areas that require a non-uniform thickness or is tapered to a thin edge, the method of acceptance testing shall be determined by the Engineer. Acceptance testing is not required on areas in which a full-size roller is restricted from compacting the mat properly. These areas shall be compacted to the satisfaction of the Engineer.

410.7.1.3-Shoulders and Ramps: As per MP 401.07.21, shoulders and ramp areas that are constructed simultaneously with the mainline are not included in the sampling plan. However, these simultaneously constructed shoulder and ramp areas shall be included in the lot of the adjacent mainline for the purposes of penalty and bonus calculations for compaction and mixture properties.

Shoulders that are constructed independently of the mainline shall be tested as per MP 401.07.21. However, compaction penalty calculations for these independently constructed shoulders shall not apply.

410.7.1.4-Thickness: Thickness testing shall be performed on all traveled lanes, ramps and independently constructed shoulders.

Cores obtained for mat density and bond strength will both be measured for thickness as per MP 410.07.22 Measurement for Thickness of Asphalt Pavement Using Drilled Cores, prior to those subsequent analyses. The core measurements which represent the thickness of the sampling units shall be analyzed to determine the average value of the pavement thickness. Pavement Thickness (T) shall include all of the pavement layers as specified excluding any patch and level course and scratch courses. This value will be used to determine the degree of compliance with the provisions and to develop certain factors to be used in the derivation of equitable deductions as set forth in Section 410.13.5, in the event the provisions of this Specification are not met.

410.7.1.5-Bond Strength: Bond Strength Testing shall be conducted to ensure the creation of a monolithic layered pavement; this is typically achieved by the application of a tack coat between pavement layers. Any tack coats applied by the Contractor shall be applied in accordance with Section 408.

Bond Testing shall be performed on all surface layers beginning with the existing pavement layer and then all intermediate pavement layers called for in the proposal and plans, this testing shall be performed on all traveled lanes and shoulders. Bond Testing is not required for pavement layers placed on top of a granular type layer (aggregate base, rubblized concrete, macadam, etc.).

If an asphalt pavement layer is to be placed atop a concrete surface, Bond Strength testing is not required however, a tack coat shall be applied in accordance with Section 408 to ensure complete coverage of the surface and to the satisfaction of the Engineer.

Core bond strength shall exceed a minimum of 100 psi when tested in accordance to MP 410.07.23 Guide to Determining Interface Bond Shear Strength.

410.7.2-Surface Tolerance: Shall be in accordance with Section 720 on the finished mat.

410.7.3-Pattern Segregation: Pattern segregation is continuous or repeated areas of non-uniform distribution of coarse and fine aggregate particles in the finished mat. The Division will address pattern segregation as follows:

410.7.3.1-Evaluating Pattern Segregation: If the Engineer observes pattern segregation that may result in defective pavement, then:

i. The Inspector will notify the Contractor of the observed pattern segregation.
ii. The Contractor may continue to work at their own risk while they immediately

and continually adjust the operation to eliminate the pattern segregation from future work.

iii. As a minimum and in the presence of the Engineer and the Contractor's Representative, Division personnel shall determine the average depth of pavement surface macrotexture according to MP 401.07.24 in areas with the pattern segregation and in areas with non-segregated pavement. The pattern segregation is unacceptable if the difference in average pavement texture depth between the non- segregated and segregated areas exceeds the following:
   a. For 9.5 mm or Wearing I mixes – 0.012 inch ~~(0.305 mm)~~
   b. For 12.5 mm mixes – 0.016 inch ~~(0.406 mm)~~

iv. The Engineer will determine if the pavement is defective as specified in Section 410.7.3.3.

410.7.3.2-Test Section: If the macrotexture tests identify unacceptable pattern segregation, then:

i. Immediately suspend placing the asphalt course. Evaluate the cause of pattern segregation according to the Paving Operation QC Plan. Provide proposed corrective actions to the Engineer and do not resume placing the asphalt course until after the Engineer reviews the proposed corrective actions and authorizes paving to continue.

ii. Determine if the pattern segregation resulted in defective pavement as specified in Section 410.7.3.3.

iii. After the Engineer allows paving to resume, place a test section not to exceed 200 tons. If the corrective actions do not eliminate observed pattern segregation, the Department will suspend paving, even if it is before the Contractor places the entire test section. Propose additional corrective actions and construct another test section. Resume normal paving operations after constructing an entire test section without pattern segregation as determined by the Engineer.

410.7.3.3-Defective Pavement: At locations selected by the Engineer and with the Engineer present, drill three 6-inch diameter cores from the area of pattern segregation and three cores from the pavement representing a non-segregated area. Do not compress, bend, or distort samples during cutting and handling and immediately provide the cores to the Inspector. The Inspector will transport cores to the producer's laboratory. With the Engineer present, test the cores at the plant for density, asphalt content, and gradation. Additional cores and/or additional testing as per MP 401.07.24 Measuring Pavement Macrotexture Depth can be used to further evaluate the pavement.

An area of pattern segregation contains defective pavement if:

a. the summation of absolute deviations from any two sieves is 20% or more from the JMF;
b. the core density is defective, the mixture is defective in asphalt content;
c. or the mixture is defective for percent passing the 75 µm (No. 200) sieve.

The core density is defective, or the cores are defective for asphalt content or gradation of the 75 µm (No. 200) sieve if the PWL is less than 55 as determined in accordance with MP 401.13.50 and based on three samples (n=3). Remove and replace the full width of the

affected lane and a minimum of 5 feet beyond each end of the area with unacceptable pattern segregation. Construct replacement pavement conforming to the appropriate surface tolerances.

410.7.4-Flushing: Provide a mix that will not flush. Flushing is continuous or repeated areas of excessive asphalt on the pavement surface. The Division may recognize flushing until the Division approves the project through final inspection. The Division will address flushing as follows:

410.7.4.1-Evaluating Flushing: When the Engineer observes flushing, then:

i. The Engineer will immediately notify the Contractor of the observed flushing.
ii. The Contractor may continue work at its own risk while it immediately and continually adjusts the operation to eliminate flushing from future work.
iii. In the presence of the Engineer, determine the average depth of pavement surface macrotexture according to MP 401.07.24 in areas of suspected flushing. If the average texture depth is less than or equal to 0.006 inches ~~(0.152 mm)~~, then the pavement will be considered to be flushed and is defective.

410.7.4.2-Test Section: If the macrotexture tests identify flushing, then:

i. Immediately suspend placing the paving course. Evaluate the cause of flushing according to the Paving Operation QC Plan and as directed. Provide proposed corrective actions to the Engineer and do not resume placing the paving course until after the Engineer reviews the proposed corrective actions and authorizes paving to continue.
ii. Remove and replace the defective wearing course at no cost to the Division for the full width of the affected lane and a minimum of 5 feet beyond each end of the area of defective wearing course. Construct replacement wearing course conforming to the appropriate surface tolerances.
iii. After the Engineer allows paving to resume, place a test section not to exceed 200~~TN~~ tons. If the corrective actions do not eliminate observed flushing, the Division will suspend paving even if it is before the Contractor places the entire test section. Propose additional corrective actions and construct another test section. Resume normal paving operations after constructing an entire test section without flushing as determined by the Engineer.

410.8-BLANK

410.9-EQUIPMENT:

410.9.1-Plants: All plants shall meet the general requirements set forth in AASHTO M156 unless it can be demonstrated to the satisfaction of the Engineer that a consistent quality mix can be produced with modifications to any of these requirements.

All plants in West Virginia producing asphalt for the Division shall provide documented evidence of compliance with current requirements of the West Virginia Air Pollution Control Commission.

All plants which are not in West Virginia but producing asphalt for the West Virginia Division of Highways shall provide documented evidence of compliance with current

requirements of the laws and regulations of the State in which they are producing, applicable to air pollution.

410.9.2-Dust Collector: An efficient dust collecting system shall be provided to prevent the loss of fine material. The material collected may be returned to the mixture at a uniform rate or discarded.

410.9.3-Truck Scales: Truck scales shall be provided at each Plant, except that truck scales are not required at properly calibrated automatic batching plant facilities which are equipped with digital printout equipment, and which load the trucks directly from the mixer or the weigh hopper in a surge or storage silo.

A person designated as a weigher shall be provided by the producer. The weigher shall certify that the weight of the asphalt, as determined either by the truck scales or from the digital printout of the batch weights, is correct.

Each truck shall be weighed empty prior to each load, except at automatic batch plants approved to operate without truck scales.

All truck scales shall be mounted on solid foundations which will insure them remaining plumb and level.

Approval and sealing of scales shall be conducted at the frequency determined by the West Virginia Division of Labor, Bureau of Weights and Measures, and when the plant is moved, or upon the request of the Engineer. The Engineer shall be notified of any scale malfunctions when material is being furnished to Division of Highways projects. The Division may, at its option, accept inspection and sealing by out-of-state agencies when the mixing plant is located outside West Virginia.

A digital recorder shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare and net weights, and the time, date, truck identification, and project number. Provision shall be made for constant zero compensation and further provision shall be made so that the scales may not be manually manipulated during the printing process. The system shall be interlocked so as to allow printing only when the scale has come to rest. In case of breakdown of the automatic equipment, the Engineer may permit manual operation for a reasonable time, normally not to exceed 48 hours, while the equipment is being repaired.

The scales shall be of sufficient size and capacity to weigh the loaded trucks that are used for delivery of asphalt from the plant.

410.9.4-Test Weights: As part of its standard equipment, each plant which proportions aggregate by weight shall provide a minimum of ten 50-pound ~~(22.68 kg)~~ test weights for the purpose of verifying the continued accuracy of its weighing equipment.

Plants which proportion asphalt material by weight shall furnish, in addition to the above, one five pound ~~(2.268 kg)~~ test weight.

410.9.5-Surge and Storage Silos: During the normal daily operation of the plant, asphalt may be stored in a surge or storage silo for a maximum of ~~12~~ 6 hours, provided the silo has received prior evaluation and acceptance through the District plant inspection. The resulting temperature of the material at time of placement and compaction shall be sufficient to comply with 410.10.~~13 and 410.10.4~~

~~Longer silo storage times, up to 24 hours, may be permitted for dense graded asphalt if the storage silo is insulated and/or heated to assure that the proper mix temperature is maintained. The gates at the bottom of the storage silo shall be adequately heated and sealed when the asphalt is held for the extended period of time. When asphalt is stored for the extended time period, it shall not be used until the temperature has been checked and the asphalt has been visually inspected for hardening of the mix and stripping of the asphalt from the aggregate. Approval of the extended storage time may be revoked if it is determined through inspection and/or testing that the extended storage is having a detrimental effect on the asphalt.~~

410.9.6-Inspection of Equipment and Plant Operations: The Engineer shall have access to the plant to assure the adequacy of the equipment in use, to inspect the conditions and operation of the plant, to verify weights, to verify the proportion and character of materials, and to determine if specified temperatures are being maintained in the preparation of the mixture.

410.9.7-Trucks for Transporting Mixture: 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 for use as a release agent. Any commercial release agent which is certified 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. All excess release agent shall be removed from the truck bed prior to loading the asphalt.

All truck beds shall be insulated with approved material. No trucks shall be used which cause segregation of the materials, which show large oil leaks, or which cause undue delays in delivery of material. All trucks shall be provided with a waterproof cover and a hole in the body for the purpose of conveniently checking the temperature of the load. Covers shall be suspended slightly above the mixture, shall extend over the sides of the truck, and shall be securely fastened to eliminate air infiltration and to prevent water from coming in contact with the mixture.

410.9.8-Laboratory: A testing facility or laboratory, as described below, shall be provided within reasonable proximity of the asphalt plant. Plant operations must be visible from within the laboratory.

The laboratory shall be of sufficient size to hold all laboratory test equipment and supplies with adequate floor space to allow the technicians to test samples in an efficient manner. The laboratory shall be furnished and maintained with adequate ventilation, heat, light, water, sink and drainage, electrical or gas outlets, or both, work table, shelves, and supply cabinets.

The laboratory shall be supplied with the equipment and materials listed below and these shall be maintained to meet the applicable requirements of AASHTO or ASTM:

i. Hot plate, gas or electric.
ii. Large ovens (as needed for heating and drying samples), gas or electric.
iii. Unit weight container, ½ cubic foot ~~(0.014 cubic meter)~~. Required for slag only.
iv. Balances of sufficient capacity and accuracy for conducting specified tests and plant calibration.

v. Thermometers: dial type, liquid-in-glass, and digital as required for conducting standard test procedures and monitoring mix temperatures. Digital thermometers shall be equipped with an appropriate sturdy probe that can be pushed into a sample of hot asphalt to check the temperature of the mix.
vi. Ro-Tap Sieve shaker or equivalent, with 8 and/or 12 inch ~~(200 and/or 300 mm)~~ diameter screens.
vii. Sample splitters for fine and coarse aggregates.
viii. Miscellaneous items (including sample splitting trowels, scoops, square point shovel, aggregate sample pans, heat resistant gloves, measuring rules, ~~brushes,flashlight~~brushes, flashlight, timing devices, and glassware as needed).
ix. Expendable supplies necessary for performance of tests.
x. Equipment for determining the maximum specific gravity of asphalt mixtures as specified in AASHTO T209.
xi. Non-contact infrared thermometer accurate to ± 2° F ~~(± 1° C)~~.
xii. Equipment for determining the bulk specific gravity of asphalt mixtures using saturated surface dry specimens complying with AASHTO T166.
xiii. Marshall equipment necessary to comply with AASHTO T245 and ASTM D5581, including a calibrated automatic testing apparatus having recording capabilities and compaction hammers. (Marshall designs only)
xiv. Asphalt content ignition oven with built-in scale and printer meeting the requirements of AASHTO T308, Test Method A.
xv. Calibrated Gyratory compactor meeting requirement of AASHTO T312 with computer (including software for data acquisition and test calculations) and printer. Compactor must be calibrated to the internal angle in accordance with AASHTO TP71 with annual verification (Superpave designs only).

410.9.9-Asphalt Paving Equipment: Asphalt paving equipment shall be self-contained and of sufficient size, power, and stability to receive, distribute and strike-off the asphalt mixture at rates and widths commensurate with the typical sections and other details shown on the plans. The paver shall be provided with an activated screed or strike-off assembly equipped to be heated. Approval of the paver by the Engineer will be based on the demonstrated capability of the equipment to place the mixture to the required cross-section, profile, and alignment in an acceptable, finished condition ready for compaction.

The paver shall be equipped with means of preventing the segregation of the coarse aggregate particles when moving the mixture from the paver hopper to the paver augers. It shall also be capable of pushing a sufficient amount of the mixture under the auger gearbox to prevent streaking or tearing of the mat. Some paver models may require the installation of a manufacturer retrofit kit or equipment modification to accomplish this.

Specialized equipment or hand methods approved by the Engineer may be employed to spread the asphalt mixture where the use of standard full-scale paver is impractical due to the size or irregularity of the area to be paved.

Pavers shall be equipped with mechanical or automatic grade and slope controls. The use of automatic grade and slope controls with a traveling straight edge shall be required only when specified on the Plans or in the Proposal. Both the grade and slope controls shall be in working order at all times. In the event of failure of the automatic controls, the Contractor will be

permitted to finish the day's work using manual controls but will not be allowed to resume work the following day until the grade and slope controls are in proper working order.

410.9.10-Compaction Equipment: Compaction may be performed by self-propelled steel-wheeled, pneumatic-tired and/or vibratory rollers. Hand-held rollers or vibrating plates may be used in small inaccessible areas if 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.

410.10-PAVING OPERATIONS:

410.10.1-Spreading and Finishing: Before spreading any material, the contact surfaces of curbs, gutters, manholes, and of adjacent Portland cement concrete pavement edges shall be painted or sealed with asphalt material. Exact edge of pavement, except on concrete, shall be established by a string or chalk line for a distance of not less than 500 feet ahead of the spreading operation. For projects where the existing pavement was milled prior to the placement of new asphalt, the edge of pavement shall be the edge of milled section.

For mixes produced with neat (non-modified) asphalts (which may include PG 64H- 22, PG 64S-22, PG 58H-28, and PG 58S-28) the temperature of the mixture at the time of placement shall be within the temperature requirements of the JMF. The JMF temperature range shall be the liquid asphalt supplier's specified mixing temperature ±45°F ~~(±25°C)~~ with a maximum mixing temperature of 338°F ~~(170°C)~~. Additional allowances will be made for water injection processes with a minimum mixing temperature of 220°F ~~(105°C)~~.

The mix temperature shall be monitored by inserting a thermometer into the mix through the hole in the truck bed.

The temperature of the completed mix, when measured at the plant, shall be within the tolerance as established by the JMF. The first load which demonstrates temperatures outside of that range shall be accepted, provided that the temperature is still within the master temperature range. No additional loads of material shall be run out until necessary steps are taken to reestablish the temperature of the mix within the plant tolerance. When measured at the project site, the temperature of the mix shall be within the tolerance established by the JMF. The first truck load of material which demonstrates temperatures outside of that range or any trucks in transit at that time shall be accepted provided temperatures are within the master temperature range. Any truckload of material which exceeds the master temperature range may be rejected by the Engineer. However, the plant shall immediately be notified that no additional loads of material are to be dispatched until necessary action is taken to reestablish temperature within JMF specification limits.

When the surface temperature falls to within 10°F ~~(6°C)~~ of the weather restrictions of Table 410.8, the mix temperature may be increased up to a maximum of 338°F ~~(170°C)~~ unless otherwise specified by the asphalt supplier. The temperature of each truckload of material shall be monitored for compliance. Any truckload of material which exceeds this maximum temperature may be rejected by the Engineer.

Mixes produced with asphalts that contain modifiers for high or low temperature performance enhancement shall meet the temperature requirements recommended by the asphalt supplier, as determined using the mid-point of the mixing temperature range shown on the asphalt temperature-viscosity charts and allowing for ± 25°F ~~(14°C)~~.

410.10.2-Safety Edge: When the total specified lift thickness of pavement is 1.5 inches or greater, asphalt safety edge shall be constructed on the outside pavement edge. The device utilized shall be a model listed on Division Approved Product Listing.

The resulting finished surface of the safety edge shall be sufficiently consolidated so as to show no segregation or raveling of the aggregate and shall have the same surface profile and texture of the compacted mat surface.

Safety edge is not to be used through intersections, against curb or barrier, or when directed by the Engineer. The paving operation shall allow for automatic and/or manual transitions at cross roads, driveways, and intersections. The Engineer may allow short sections of handwork for transitions at driveways, intersections, interchanges, and bridges.

410.11-PROTECTION OF PAVEMENT AND TRAFFIC CONTROL:

The Contractor shall be responsible for the protection of asphalt surfaces from damage by their equipment and personnel. When the construction of asphalt surfaces is undertaken on projects under public traffic and the road surface is 16 feet wide or greater and the ADT is 400 or greater, the Contractor shall place no passing signs, Interim pavement markings, and Temporary pavement markings to delineate the edge line, centerline, and/or lane line of the roadway as required herein and in the project plans. The provision of Section 336: Maintaining Traffic shall apply.

Interim markings are described as markings applied to freshly resurfaced roadways between lifts and after placement of the final lift prior to opening the portion of the roadway being resurfaced to traffic. These markings are intended to provide the minimum amount of delineation required for safe navigation of the roadway and are to be succeeded by Temporary markings within a three (3) to fourteen (14) day period, based on the type of roadway and ~~A~~ADT, as specified herein. Interim and Temporary markings shall conform to the requirements of Section 663: Pavement Markings.

410.12-METHOD OF MEASUREMENT:

Asphalt will be measured by the Square Yard (SY). The quantity will be determined by the Plan Quantity as provided for in the proposal unless otherwise directed by the Engineer.

Any patching or leveling mixture placed on a subbase or base course constructed in the same Contract with the asphalt items shall be at the expense of the Contractor. No additional compensation will be allowed for the material or any work incidental to its placement unless otherwise approved by the Engineer. No additional measurement is necessary nor will addition compensation be allowed for the placement of Safety Edge.

410.13-BASIS OF PAYMENT:

The quantities determine as provided above, will be paid for at the contract unit price for the items listed below, which prices and payment shall be full compensation for furnishing all the materials and doing all the work herein prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, field laboratory, supplies, tack coat, and incidentals necessary to complete the work and provide the performance criteria specified.

There will be no additional compensation for Interim Pavement Markings**.**

410.13.1-When a Lot of asphalt material is found not in compliance with the tolerance requirements for asphalt content and gradation as shown in MP 401.02.31, it shall be subject

to a price adjustment in accordance with the criteria for Determination of Percent Within Limits established in MP 401.13.50 and pay factors in Table 410.13.3.1.

410.13.2-Blank

410.13.3- For Interstates and divided NHS Highways, the unit price for each Lot of asphalt pavement Mat shall be adjusted as follows in Table 410.13.3.1 in accordance with MP 401.13.50. For two-lane and non-divided NHS Routes, the pay factor for asphalt content and percent passing the 75 µm (No. 200) sieve shall be determined by Table 410.13.3.1. However, the mat density pay factor shall be determined by Table 410.13.7.2.

TABLE 410.13.3.1

Percentage of Material Within Specification Limits (PWL)	Lot Pay Factor (Percent of Contract Unit Price)
96-100 Note 1	102 Note 1
90-95	100
75-89	[(0.5)PWL]+55
55-74 Note 2	[(1.4)PWL]-12

Note 1 Payment of 102% for mat density shall be subject to additional requirement of the average compaction for the lot being evaluated to be a minimum of 93% density.

Note 2 Material with a PWL less than 55 is considered defective and will be considered for removal and replacement of the lot. If only one lot characteristic has a percent within limits less than 55, the Engineer, may allow the Contractor to leave the defective lot in place. The decision to remove and replace the subject lot shall include evaluation of all lot characteristics for pay and surface characteristics as per guidelines set forth in MP 401.07.25. If the material is left in place, the Department will pay for the defective lot at a value not to exceed 50% of the contract unit price of asphalt per square yard. (~~ie~~i.e., Contract unit price = $10 sy → $5 sy max)

410.13.3.1-Price Adjustment: The Division will compute the percent of the contract unit price paid as follows:

$$\text{Lot Payment} = CP\ (2PD + PB + PA) / 400$$

Where:

CP = Contract unit price per lot (unit price times lot quantity)
PD = Payment Factor Percentage for mat density
PB = Payment Factor Percentage for asphalt content.
PA = Payment Factor Percentage for percent passing the 75 µm (No. 200) sieve

Shoulders and ramps shall be included in penalty calculations for mixture and compaction unless they are constructed independently, where the density requirements shall be waived. When compaction requirements are waived, PD will be minimum of 100.

410.13.4-Joint Density Adjustments: For Interstates and divided NHS Highways, joint Density PWL calculations shall be in accordance with MP 401.13.50. Joint Density bonus adjustments will be calculated for joint lots with a PWL greater than or equal to 80. Joint Density negative adjustments will be calculated for joint list with a PWL less than or equal to

60. Price adjustments shall be calculated using the formulas below. There will be no adjustment for joint lots who's PWL falls between 60 and 80.

Bonus adjustment calculated as follows:

$$\$T = \frac{PWL-80}{20} \text{ X } 4{,}000$$

Negative adjustment calculated as follows:

$$\$T = \frac{60-PWL}{60} \text{ X } 12{,}500$$

Adjustments calculated for lots less than or greater than 10,000 feet in length shall be prorated directly proportional to the amount of length less than or greater than 10,000 feet.

For two-lane and non-divided NHS Routes, refer to Section 410.13.7.3.

410.13.5-Thickness Adjustments: No payment will be made for pavement areas deficient in thickness by more than 35% T.

Pavement which is deficient in thickness by more than 50% T is considered to be inadequate to perform satisfactorily and shall be removed and replaced at no added cost to the Division.

The balance of the item, the portion of the item not treated in the manner set forth above, will be treated in the manner set forth in 410.13.5.1 below.

410.13.5.1-Price Adjustments for Thickness - When all individual measurements meet or exceed the specified thickness, there will be no adjustment for payment. If any individual values or when the average value of the pavement thickness per lot is less than the specified total thickness, the quantity of pavement represented by this average thickness will be paid by a direct calculation as defined as follows:

$$\text{Price Adjustment } \% = \left(\frac{t}{T}\right) x100$$

Where:

T = Total Plan Thickness

t = avg. lot thickness + 0.04 in.

This value is then applied to the unit price for the asphalt place in the lot, this adjustment shall remain separate from the PWL adjustments for AC, Gradation, Density, etc.

410.13.6-Bond Strength Adjustment: For Interstates and divided NHS Routes, bond Strength PWL calculations shall be in accordance with ~~410.13.50~~ MP 401.13.50, Guide to Statistical Analysis of Material Using Quality Level Analysis-Percent within Limits. However, for the purpose of relieving large standard deviations from abnormally strong samples, any sample with a strength exceeding 150 psi will be evaluated as 150 psi instead of the actual strength. The actual strength ~~should~~ shall still be recorded as such on the reporting form.

Bond Strength positive adjustments will be calculated for lots with PWL greater than or equal to 90. Bond Strength Negative adjustment will be calculated for lots with PWL less than or equal to 70. There is no adjustment for bond Strength lots who's PWL falls between 70 and 90.

Positive adjustment calculated as follows:

$\$T = \frac{PWL-90}{20}$ X ~~2,000~~ 5,000

Negative adjustment calculated as follows:

$\$T = \frac{70-PWL}{70}$ X ~~40,000~~ 25,000

Adjustments calculate for lots less than or greater than the standard 2,500 tons shall be prorated directly proportional to the amount of tonnage less than or greater than 2,500 tons. This shall be calculated on the theoretical tonnage for the lot, not the actual tonnage used.

For two-lane and non-divided NHS Routes, refer to Section 410.13.7.4

410.13.7 – Two-Lane and Non-divided NHS Route Exceptions: Due to the wide range of variability on the roadway, the following exceptions for lot/sublot layout and analysis of existing condition dependent test results shall apply:

410.13.7.1-Acceptance Testing of Asphalt: A lot shall consist of three (3) to seven (7) equal sublots. A normal sublot size is 500 tons unless operational conditions and sublot size dictate otherwise. Determine the number of sublots on the project by converting the square yardage of the travel lanes and simultaneously paved shoulders to tonnage. Divide the tonnage by 500 and round to the nearest whole number (n). Use that number (n) in Table 410.13.7.1 to determine the number of lots to be used for acceptance.

TABLE 410.13.7.1

Number of Sublots (n)	Number of Lots
3 to 7	1 Lot with (n) even sublots
8	2 Lots with 4 even sublots each
9	2 Lots - Lot 1, 5 Sublots / Lot 2, 4 Sublots
10	2 Lots with 5 even sublots each
11	2 Lots - Lot 1, 6 Sublots / Lot 2, 5 Sublots
12	2 Lots with 6 even sublots each
13	2 Lots - Lot 1, 7 Sublots / Lot 2, 6 Sublots
14	3 Lots - Lot 1, 5 Sublots / Lot 2, 5 Sublots / Lot 3, 4 Sublots
15	3 Lots with 5 even Sublots each

Turn lanes, intersections, and independently constructed shoulders shall not be subject to price adjustments, positive or negative, if the combined square yardage converts to less than 500 tons. If the square yardage converts to over 500 tons, then one additional sublot for asphalt content, percent passing the 75 µm (No. 200) sieve, and bond strength shall be added to the last lot constructed. Compaction shall be monitored, documented, and submitted to the Engineer by a certified Asphalt Field and Compaction Technician to assure that it meets specification requirements.

410.13.7.2 -Basis of Payment: The payment factor for density shall be adjusted as follows in Table 410.13.7.2. This payment factor (PD) will then be used in the Lot Payment calculation formula in Section 410.13.3.1.

TABLE 410.13.7.2

Payment Factors for Pavement Mat Density	
Average Lot Percent Density	**Payment Factor (PD)**
Greater than 98 %	Note 1
94.00% to 98.00%	102
93.00% to 93.99%	101
91.50% to 92.99%	100
88.00% to 91.49%	= 100 – 4*(91.50% - Percent density)
Less than 88%	= 84 – 10*(88% - Percent density) Note 2

Note 1 Mat density slightly above 97% is normally only a problem if it leads to asphalt flushing on the surface of the mat or rutting due to an unstable mix. The Division will make a special evaluation of the material and determine the appropriate action.

Note 2 When the density is less than 92%, the mat will be more susceptible to accelerated deterioration and a decrease in the expected service life of the pavement. For mat densities less than 88%, the percent of Contract Bid Price will be decreased by an additional 10% per percentage of mat density less than 88%, unless a Special evaluation performed by the Division determines a more appropriate action.

410.13.7.3-Joint Density Adjustments: The adjustment for joint density shall be determined by Table 410.13.7.3. This adjustment is per linear foot and will be multiplied by the total number of liner feet in the lot to determine the total lot adjustment. This is calculated per lot and applied per Section 410.13.8.3.

TABLE 410.13.7.3

Pay Adjustment for Pavement Joint Density per Linear Foot	
Average Lot Percent Density	Price Adjustment ($ / LF)
Greater than 97 %	Note 3
94.00% to 97.00%	0.40
91.50% to 93.99%	= [0.40 – {0.12*(94.00 - Percent Density)}]
89.00% to 91.49%	0
88.00% to 88.99%	-0.20
Less than 88%	= [{0.50*(Percent Density – 88.00)} – 0.20]

Note 3 Joint density slightly above 97% is normally only a problem if it leads to asphalt flushing on the surface of the mat or rutting due to an unstable mix. The Division will make a special evaluation of the material and determine the appropriate action.

410.13.7.4-Bond Strength Adjustments: The adjustment for bond strength shall be determined by Table 410.13.7.4. This is calculated per lot and applied per Section 410.13.8.4. This shall be calculated on the theoretical tonnage for the lot, not the actual tonnage used.

TABLE 410.13.7.4	
Pay Adjustment for Bond Strength per 2500 Ton Lot	
Average Lot Bond Strength (PSI)	**Price Adjustment ($ / Lot)**
Greater than 150.00	5,000
100.00 to 149.99	= [5,000 – 100*(150.00 – PSI)]
75.00 to 99.99	= [{1,000*(PSI - 75.00)} – 25,000]
Less than 75.00	- 25,000

410.13.~~7~~8-Lot Payment Calculations: The pay factors that are calculated with in the specification are to be applied in the following way:

410.13.~~7~~8.1-PWL Factors: The calculated total PWL for a given lot is applied to the bid unit price for the asphalt mixture in the lot. Once the unit price has been adjusted the quantities can be calculated to arrive at the payment for the lot.

410.13.~~7~~8.2-Thickness Adjustment: There is no adjustment for thickness greater than the thickness that is specified in the plans. If there is a Price Adjustment (Section 410.13.5) for thickness this factor (percentage) is applied to the contract bid unit price times the quantity in the lot to arrive at a dollar amount penalty. This penalty is applied to the overall payment for the lot.

410.13.~~7~~8.3-Joint Density Adjustment: If it is determined in Section 410.13.4 of this specification that a Joint Density Adjustment is warranted the dollar amount determined in the formulas of Section 410.13.4 or Table 410.13.7.3 shall be applied to the overall payment for the lot.

410.13.~~7~~8.4-Bond Strength Adjustment: If it is determined that a Bond Strength Adjustment is warranted ~~by~~ the formulas in Section 410.13.6 or Table 410.13.7.4 shall be used to calculate the adjustment. This adjustment shall be applied to the overall payment for the lot.

410.14-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
410001-*	"design method" Asphalt Base Course, Type "mix type"	Square Yard ~~(Meter)~~
410002-*	"design method" Asphalt Wear Course, Type "mix type"	Square Yard ~~(Meter)~~
410007-*	"design method" Asphalt Skid Pavement, Type "mix type"	Square Yard ~~(Meter)~~

* Sequence number
"design method" shall be either Marshall or Superpave
"mix type" from Table 401.4.2A or 401.4.2B

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 663
PAVEMENT MARKINGS AND RUMBLE STRIPS

663.1-DESCRIPTION:

ADD THE FOLLOWING SUBSECTION:

663.1.3-Bicycle Lane Background Markings: Green Type V thermoplastic material is to be used for bike lane backgrounds where designated on the Plans to highlight lane separation and correct position for users of bicycle lane and is to be installed within bicycle lanes as a supplement to the other pavement markings that are required for the designation of a bicycle lane.

663.2-MATERIALS:

ADD THE FOLLOWING SUBSECTION:

663.2.1-Green Thermoplastic:

A. Daytime chromaticity coordinates for the color used for green colored pavement markings shallbe as follows:

1		2		3		4	
x	y	x	y	x	y	x	y
0.230	0.754	0.266	~~0.500~~ 0.460	0.367	~~0.500~~ 0.480	0.444	~~0.555~~ 0.583

The daytime luminance factor (Y) shall be at least 7, but no more than 35.

~~B. The nighttime chromaticity coordinates for the color used for green colored pavement markings shall be as follows:~~

~~1~~	~~2~~	~~3~~	~~4~~

~~x~~	~~y~~	~~x~~	~~y~~	~~x~~	~~y~~	~~x~~	~~y~~
~~0.230~~	~~0.754~~	~~0.266~~	~~0.500~~	~~0.367~~	~~0.500~~	~~0.444~~	~~0.555~~

~~C.~~B. The material utilized shall be a thermoplastic material meeting the requirements contained in Section 715.40.2 and listed under the "Enhanced Skid Resistant Material" subcategory on the current APL for Type V Pavement Markings, except the material shall be non-retroreflective. The performance of the material shall be covered by the manufacturer's warranty.

~~D.~~C. Sizes of the individual sections of pre-formed thermoplastic used shall be such that the distance between successive lateral joints is a minimum of three feet, and no more than one material longitudinal joint is present at any point along the length of the lane. If white standard bike lane markings are also to be placed where bike lane background markings are to be placed, the white markings shall be pre-fabricated integral to the section of background material and shall meet the retroreflectivity requirements of the Specifications.

663.6-METHOD OF MEASUREMENT:

ADD THE FOLLOWING:

Green Type V material shall be measured and paid as the actual area in square feet of pavement markings satisfactorily placed and accepted by the Engineer.

663.8-PAY ITEM:

ADD THE FOLLOWING ITEMS TO THE TABLE:

ITEM	DESCRIPTION	UNIT
663025-001	Bicycle Lane Background Markings, Type V	Square Feet

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 601
STRUCTURAL CONCRETE

601.1-GENERAL:

ADD THE FOLLOWING SUBSECTION:

601.1.1-Ultra High Performance Concrete: The Contractor shall furnish all materials, tools, and labor necessary for the performance of all work to form, cast, finish, and cure Ultra High Performance Concrete (UHPC) where required per plan. Before casting UHPC for actual construction, the Contractor will cast mockups to demonstrate the ability to properly cast the UHPC.

All UHPC shall be premixed/prebagged product provided ready for site mixing and installation by one of the following manufacturers:

1. ceEntek, Inc.
2. Cor-Tuf UHPC
3. Holcim US, Ductal®
4. Steelike, Inc.

UHPC manufacturers shall submit product data sheets and test reports from an AASHTO accredited independent testing laboratory for UHPC testing showing that the product meets the requirements of this Special Provision. Any change of materials or material sources shall require a submission of new test reports by an AASHTO accredited independent testing laboratory for UHPC testing showing conformance of the UHPC with this Special Provision. The UHPC concrete mixture described in this Special Provision shall be used at all locations specified in the Contract Plans.

601.2-MATERIALS:

ADD THE FOLLOWING:

A. UHPC: Use a UHPC premixed/prebagged product supplied by one of the manufacturers identified in 601.1.1. The UHPC shall have an optimized gradation of granular constituents, super plasticizer, and water, and shall have a minimum steel fiber content of 2% by volume and be able to achieve the following material and durability properties:

Material Characteristic Description	Test Method	Pre-Constr. Testing	Constr. Testing	Testing Frequency	Acceptance Criteria
Flow**	ASTM C1437 (as modified by ASTM C1856)	Yes	Yes	Once per batch	7 to 10 inches
Min. Compressive Strength at 4-days	ASTM C39 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	14 KSI
Min. Compressive Strength at 28-days	ASTM C39 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	20 KSI
Flexural Tension Stress, first crack ~~peak~~ strength, minimum	ASTM C1609 (as modified by ASTM C1856)	Yes	Not Required	N/A	1.5 KSI
Flexural Tension Stress, peak strength, minimum	ASTM C1609 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	2.0 KSI
Long-Term Shrinkage	ASTM C157 (as modified by ASTM C1856)	Yes	Not Required	N/A	≤ 800 microstrain at 28-days
Scaling Resistance	ASTM C672-12	Yes	Not Required	N/A	y < 3
Abrasion Resistance	ASTM C944 (2x weight; ground surface)	Yes	Not Required	N/A	< 0.025 oz. lost
Chloride Ion Penetrability	ASTM C1202	Yes	Not Required	N/A	≤ 500 coulombs by 28-days
Freeze-Thaw Resistance	ASTM C666A	Yes	Not Required	N/A	RDM ≥ 95% after 300 cycles
Alkali-Silica Reaction	ASTM C1567	Yes	Not Required	N/A	Innocuous at 28-days

NOTE: RDM = Relative Dynamic Modulus of Elasticity
** Flow tests are to be performed on a vibration free area

B. Accelerated Curing UHPC: Use a UHPC premixed/prebagged product supplied by one of the manufacturers identified in 601.1.1. The UHPC shall have an optimized gradation of granular constituents, super plasticizer, accelerator, and water, and shall have a minimum steel fiber content of 2% by volume and be able to achieve the following material and durability properties:

Material Characteristic Description	Test Method	Pre-Constr. Testing	Constr. Testing	Testing Frequency	Acceptance Criteria
Flow**	ASTM C1437 (as modified by ASTM C1856)	Yes	Yes	Once per batch	7 to 10 inches
Min. Compressive Strength at 24-hours	ASTM C39 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	10 KSI
Min. Compressive Strength at 48-hours	ASTM C39 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	14 KSI
Min. Compressive Strength at 28-days	ASTM C39 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	20 KSI
Flexural Tension Stress, first ~~peak~~ crack strength, minimum	ASTM C1609 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	1.5 KSI
Flexural Tension Stress, peak strength, minimum	ASTM C1609 (as modified by ASTM C1856)	Yes	Yes	At least once per lot (15 yd^3) or once per 12-hr shift	2.0 KSI
Long-Term Shrinkage	ASTM C157 (as modified by ASTM C1856)	Yes	Not Required	N/A	≤ 800 microstrain at 28-days
Scaling Resistance	ASTM C672-12	Yes	Not Required	N/A	y < 3
Abrasion Resistance	ASTM C944 (2x weight; ground surface)	Yes	Not Required	N/A	< 0.025 oz. lost
Chloride Ion Penetrability	ASTM C1202	Yes	Not Required	N/A	≤ 500 coulombs by 28-days

Material Characteristic Description	Test Method	Pre-Constr. Testing	Constr. Testing	Testing Frequency	Acceptance Criteria
Freeze-Thaw Resistance	ASTM C666A	Yes	Not Required	N/A	RDM ≥ 95% after 300 cycles
Alkali-Silica Reaction	ASTM C1567	Yes	Not Required	N/A	Innocuous at 28-days

NOTE: RDM = Relative Dynamic Modulus of Elasticity
** Flow tests are to be performed on a vibration free area

C. Qualification Testing: A minimum of two months prior to placement of UHPC, the Contractor shall complete qualification testing to demonstrate that the material and durability properties in 601.2.A or 601.2.B are met. Only a UHPC mix design that passes these tests may be used. Testing shall be performed by an AASHTO accredited independent testing laboratory for UHPC testing approved by the UHPC manufacturer and the Engineer. ~~A WVDOH representative shall be present to witness the testing of the quality control samples and report the results to Cement and Concrete Group of the WVDOH, MCS&T Division.~~ The casting of mockups as described in 601.5.D shall also apply.

D. Water: Water used for mixing shall meet the requirements of 715.7 and the manufacturer's specifications. Ice may be used to displace a proportion of the water as determined by the UHPC manufacturer.

E. Admixtures: Admixtures shall be determined by the UHPC manufacturer.

F. Fiber Reinforcement: Fibers shall be 0.5 to 1.0-inch long and 0.008 ± 0.002-inch diameter made from ASTM A820, Type I steel wire with a minimum tensile strength of 290,000 psi. Steel fibers shall be Buy America Act compliant with all steel and iron components originating from the United States of America as documented by steel mill certifications.

601.3-PROPORTIONING:

ADD THE FOLLOWING SUBSECTION:

601.3.4-UHPC Submittals: The Contractor shall submit ~~batching, forming, placing, curing, and testing procedures~~ a detailed work plan to the Engineer for review and approval a minimum of thirty ~~seven~~ (30~~7~~) ~~working~~ days prior to casting. ~~The mixing sequence shall include the order and time of introduction of the materials, mixing time, and QA/QC procedure for the verification of the mix uniformity.~~ As a minimum, the following items shall be included in the work plan:

1. Quality control plan in accordance with Section 601.4.2.

2. UHPC mix design including mix ingredients and their proportions, water-to-cementitious ratio, mixing time, flow, set time, and compressive strength properties of the mix at the times shown in 601.2.A or 601.2.B.
3. Submission of qualification testing in accordance with Section 601.2.C.
4. Location of storage areas and storage requirements of UHPC material in accordance with 601.5.C.
5. Bridge plans with dimensions showing connection joints, suggested sequence of UHPC placement, and project schedule requirements. Include placement drawings with location of bulkheads and stages (if staged construction is used).
6. Working drawings and calculations for all proposed formwork, including materials and procedure for maintaining watertight joints in accordance with 601.5.D.
7. Details of top forms for deck-level connections and adequate hold downs. Top forms for deck-level connections are set at a minimum of 1/4-inch higher than adjacent surfaces to allow for all overfilling in accordance with 601.5.A.2.
8. Number, location, and details of all equipment to be used to batch, mix, and place UHPC materials.
9. Schedule and duration of traffic control measures required for completion of the work.
10. Method to attain an exposed aggregate finish with an average amplitude of 1/8-inch minimum for all precast concrete surfaces in contact with UHPC. The use of paste retarders is required to provide the required aggregate finish of precast concrete surfaces in contact with UHPC surfaces.
11. Surface preparation plan of existing concrete surfaces and pre-wetting of the existing concrete interface to a saturated surface-dry (SSD) condition immediately prior to UHPC placement.
12. Detailed plan and procedure for casting of a demonstration UHPC mockup meeting the requirements of 601.5.D.
13. Provisions for acceptable ambient temperature, batch temperatures, ambient relative humidity, batch consistency, and batch times.
14. Mixing, batching, delivery, placement, finishing, and curing procedures for UHPC.
15. Proposed schedule and procedure for watertight integrity testing of completed UHPC bridge deck joints.
16. Pre-pour meeting agenda, including UHPC Manufacturer's recommended topics.

601.5-CONSTRUCTION METHODS:

ADD THE FOLLOWING:

A. Quality Assurance:

1. The Contractor must follow the directions of the UHPC manufacturer when assisting with mixing the UHPC and must work with the UHPC manufacturer to fully understand the properties of the UHPC so that the Contractor is able to effectively place the UHPC. ~~The Contractor shall be pre-qualified by the UHPC manufacturer that they have the capability to mix and place UHPC. Proof of pre-qualification shall be submitted in writing from the Contractor to the Engineer a minimum of ten (10) working days before any UHPC is cast.~~ The Contractor shall have a UHPC Manufacturer Technical

Representative on site during all batching and placement of the UHPC material. Notify the Engineer at least 48 hours prior to the anticipated UHPC placement.

2. The top surface of the UHPC shall be formed and filled 1/4-inch higher than adjacent surfaces to allow for consolidation and then ground flush after curing, unless the entire deck surface is to be ground after placement in which case the UHPC may be placed flush with the precast surface. Other tolerances shall be in compliance with PCI Manual – 116 or otherwise specified in the Contract Plans.

B. Pre-Pour Meeting: The Contractor shall arrange for an onsite meeting with the UHPC Manufacturer Technical Representative, Construction Inspector, and Engineer to take place a minimum of one day prior to the UHPC mockup demonstration. The Contractor's staff and Construction Inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for mixing, testing, transporting, finishing, and curing of the UHPC material. The Contractor shall arrange for a UHPC Manufacturer Technical Representative to be on site during the casting of the mockup and during placement of all UHPC material. The UHPC Manufacturer Technical Representative shall be knowledgeable in the supply, mixing, batching, testing, delivery, placement, and curing of the UHPC material. Mockup shall be representative of the required placement as demonstrated in the approved work plan ~~by the Engineer~~ and shall be performed per the recommendations of the UHPC manufacturer.

C. Storage: The Contractor shall assure the proper storage of the UHPC premixed/prebagged product including powder, fibers, and additives as required by the UHPC manufacturer's specifications in order to protect materials against loss of physical and mechanical properties. Material must be used within the manufacturer's recommended shelf life.

D. Forming, Batching, Placement, And Curing: The Contractor shall work together with the UHPC manufacturer to ensure appropriate initial strength gains to meet the desired project schedule. Grinding of the UHPC surface shall be performed ~~upon recommendations from the UHPC manufacturer~~ once the UHPC has reached a minimum compressive strength of 10 KSI as validated in accordance with 601.5.E. If significant fiber pullout is observed during grinding operations, grinding shall be suspended and not resumed until approved by the Engineer. The finished surface of the UHPC shall match the proposed profile to within a tolerance specified in 601.11.4.3.

The bridge can be opened to traffic when the UHPC has been properly cured and achieved a minimum compressive strength of 14 KSI.

Construction loads applied to the bridge during UHPC placement and curing are the responsibility of the Contractor. Contractor shall submit the weight and placement of concrete buggies, grinding equipment, or other significant construction loads to the Engineer for review prior to the pre-pour meeting describe above.

Forming, batching, placing, and curing shall be in accordance with the procedures recommended by the UHPC manufacturer and as submitted and accepted by the Engineer.

The design and fabrication of forms shall follow the approved ~~installation~~ work plan ~~drawings~~ submission and shall follow the recommendations of the UHPC manufacturer. All the forms for UHPC shall be constructed from marine-grade plywood and shall have

nonabsorbent surfaces that are properly sealed and capable of resisting hydrostatic pressure from UHPC in the unhardened state.

The surfaces of all concrete against which UHPC will be placed shall have an exposed aggregate finish with an average amplitude of 1/8-inch minimum and shall be continuously wetted for a minimum of 12 hours and be in a saturated surface-dry (SSD) condition immediately prior to UHPC placement. The interface surface shall be cleaned of all laitance and other deleterious materials prior to the placement of UHPC.

Mockups of each UHPC placement shall be performed prior to actual UHPC construction and conducted per the requirements of this Special Provision and the recommendation of the UHPC Manufacturer Technical Representative. Mockups of horizontal closure pours shall be four feet in length with all other dimensions to match those required by the plans. Mockups for vertical closure pours shall be two feet in length with all other dimensions to match those required by the plans. The mockup process shall be observed by the UHPC Manufacturer Technical Representative and the Engineer.

A minimum of two portable batching units will be supplied by the UHPC manufacturer to the Contractor for mixing of the UHPC. Alternatively, the use of a ready-mix concrete truck may be approved at the discretion of the Engineer if successful implementation can be demonstrated by the Contractor. Any loss of material or equipment caused by alternate batching and placement methods shall be remediated at the Contractor's expense. The UHPC shall be mixed in equipment that has been recommended and approved by the UHPC manufacturer. The Contractor shall follow the batching sequence as specified by the UHPC manufacturer and approved by the Engineer.

Each UHPC placement shall be cast using one continuous pour wherever possible per each stage of construction. No cold joints are permitted unless previously agreed upon by the UHPC Manufacturer Technical Representative and the Engineer.

The UHPC in the forms shall be cured according to manufacturer's recommendations at a minimum temperature of 50°F to attain the design strength.

E. Acceptance Testing: The following tests shall be performed following casting of the mockup and during construction for every lot of UHPC. A lot of UHPC is defined as 15 cubic yards or one day of production, whichever comes first.

1. Concrete compressive strength test according to ASTM C39 as modified by ASTM C1856. From every lot, take four (4) sets of three (3) compressive strength test cylinders for a total of twelve (12) specimens. One set will be taken at the beginning and one set at the end of each lot. In an evenly distributed manner, take two (2) intermediate sets from the middle portion of the lot. All cylinders shall measure 3-inch diameter by 6-inches in length and shall be cured using the same method of curing proposed to be used in the field. For traceability, track all sets of specimens to lot numbers. Prior to the Contractor removing forms and initiating grinding operations, three (3) specimens shall be tested to validate the achievement of 10 KSI compressive strength. Additionally, three (3) specimens shall be tested to validate the achievement of 14 KSI compressive strength prior to ~~grinding the in-place UHPC and~~ opening the bridge to traffic. Lastly, three (3) specimens shall be tested at 28-days to verify final strength. WVDOH may reject a portion or all the in-place UHPC should testing indicate that it does not meet required minimum strengths. The rejected UHPC shall be removed and replaced or remediated to the satisfaction of the Engineer at the

Contractor's expense. The remaining three (3) specimens shall be treated as reserves for resolution testing, if needed. Final acceptance will be based on the 28-day compressive strength. Field coring of UHPC for dispute resolution is not allowed.

All UHPC specimens shall be tested by an AASHTO accredited independent testing laboratory for UHPC testing approved by the UHPC manufacturer and the Engineer. A WVDOH representative shall be present to witness the testing of the acceptance samples and report the results to Cement and Concrete Group of the WVDOH, MCS&T Division. Each UHPC cylinder sample shall have both ends ground in accordance with ASTM C1856 prior to compressive strength testing.

~~2. Cast three (3) additional 3-inch diameter by 6-inch long cylinders per lot and provide to Cement and Concrete Group of the WVDOH, MCS&T Division for their evaluation.~~

~~3.~~2. Determination of static flow shall be in accordance with ASTM C1437 as modified by ASTM C1856. The measured diameter of the UHPC at the end of the test shall be within the limits: minimum 7-inches; maximum 10-inches. The test shall be performed on every UHPC batch. The flow test must be performed in an area free of vibration to give the most accurate results.

F. Manufacturers Contacts Information: All UHPC shall be premixed/prebagged product from one of the following manufacturers:

1. ceEntek, Inc.
   38510 Crimm Rd.
   Scio, OH 43988
   Phone: 403-669-8632
   Email: USA@ceEntek.com

2. Cor-Tuf UHPC
   11128 Industrial Road
   Manassas, VA 20109
   Phone: 540-270-9239
   Email: info@cor-tuf.com

3. Holcim US
   8700 W Bryn Mawr Avenue, Suite 300
   Chicago, IL 60631
   Phone: 734-489-9555
   Email: ductal-na@lafargeholcim.com

4. Steelike, Inc.
   7631 Fullerton Road 7G
   Springfield, VA 22153
   Phone: 703-520-2763
   US Toll Free: 1-888-364-2541
   Email: info@steelike.com

601.14-METHOD OF MEASUREMENT:

ADD THE FOLLOWING:

The UHPC quantities will be measured in cubic yards, complete in place, and accepted as determined by the dimensions on the Plans or Contract Documents.

601.15-BASIS OF PAYMENT:

ADD THE FOLLOWING:

The quantity, determined as provided above, will be paid for at the contract unit price bid for this item, which price 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, field laboratory, supplies, and incidentals necessary to complete the work.

601.16-PAY ITEM:

ADD THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
601800-001	Ultra High Performance Concrete	Cubic Yard

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 207
EXCAVATION AND EMBANKMENT

207.1-DESCRIPTION:

ADD THE FOLLOWING:

207.1.1-Settlement Plate: The work specified in this section consists of the fabrication, installation, protection and maintenance of settlement plates in accordance with these Special Provisions, the details shown on the plans and as directed by the Engineer. The Contractor shall be responsible for the fabrication, installation, protection and maintenance of settlement plates.

The system of settlement plates is designed to enable the Engineer to observe and determine the magnitude and rate of embankment settlement. The determination of the time at which the necessary consolidation has taken place and the embankment may be released for additional lifts of fill or the next stages of construction will be determined by the Engineer on the basis of the data obtained from the combined settlement monitoring instrumentation.

207.2-MATERIALS:

ADD THE FOLLOWING:

207.2.3-Settlement Plate: The settlement plate assembly shall be constructed in accordance with the plate and stem options as shown on Settlement Plate Detail in the Bridge Plans. All iron pipe and fittings shall be fabricated from standard weight stock; all PVC pipe and fittings shall be Schedule 40; the sizes shall be as shown on Settlement Plate sheet in the Bridge Plans. Materials will be accepted on the basis of a visual inspection.

207.2.3.1-Installation and Monitoring: The settlement plates shall be installed after completion of clearing and grubbing below but prior to placing embankment fill. The settlement plates shall be installed by the Contractor..

The settlement plate locations are presented in the following table:

Settlement Plate #	Roadway Station	Offset (ft)
SP-1	220+80	20'LT
SP-2	220+80	CL
SP-3	220+80	20' RT

An excavation slightly larger than the settlement plate shall be made to an elevation established by the Engineer. The excavation shall form a pit having a minimum depth of twelve inches with a level bottom.

The plate shall be placed in the pit with one section of marker pipe attached. The attached marker pipe shall be 5.0 feet in length as shown in Settlement Plate Detail in the Bridge Plans. The plate shall have full bearing and the marker pipe plumb before proceeding with the stem assembly. When realignment of the plate and marker pipe is necessary, the plate and pipe shall be removed and the pit bottom reshaped for proper alignment.

With plate and marker pipe in place, wrap the lower six inches of marker pipe with oakum; slip one section of casing pipe over the marker pipe; and, lower the casing to uniformly encase the oakum seal while seating the casing on the plate as shown in Settlement Plate Detail in the Bridge Plans.

With marker pipe and casing centered with respect to each other and maintained in a vertical position, the pit shall be backfilled in layers by hand and thoroughly compacted by hand. Prior to backfilling the pit, the elevation of the top of the plate shall be determined. A maximum of one foot of soil cover can be placed to stabilize the settlement plates.

Each section of PVC casing shall be capped until the next section is added. The settlement plate stem shall be flagged and protected from construction vehicles and equipment. If the settlement plate assembly is disturbed, it shall be replaced in kind within 24 hours, unless otherwise directed by the Engineer.

The embankment material in the immediate vicinity of the settlement plate stem shall be placed and compacted in accordance with the requirements of the Specifications, or as directed by the Engineer. Embankment within three feet of the stem shall be placed and compacted by hand with non-impact, light vibratory plate compactors.

When surface of the embankment reaches a level approximately two feet below the top of the stem section in place, the next section of marker pipe and casing shall be installed, the casing shall be capped, and the stem flagged for protection. Added sections shall be five feet in length.

As the height of the embankment increases, this procedure shall be repeated until the embankment is completed.

Settlement plate assemblies shall remain in place and become the property of the West Virginia Division of Highways.

The Contractor will obtain and record all measurements and elevations necessary for the accurate determinations of settlement data following construction of the embankment. Elevations shall be surveyed once a week for a minimum of two months after completion

of fill placement. The surveying must be performed by leveling methods using instruments and methods to yield a vertical accuracy of plus or minus 0.002 feet. Establish a benchmark on stable ground that is not subject to settlement and is located away from any earthwork/construction activities. The settlement data should be provided to the engineer to evaluate when foundation construction can proceed. It is expected that construction of the abutment foundations can proceed once it is determined that the rate of settlement is less than 1/10 of an inch per week for at least two consecutive weeks at each settlement plate location.

207.2.3.2-Protection and Maintenance: The settlement plate stem shall remain in a vertical position at all times during the life of this Contract. The Contractor shall operate his equipment in a manner to insure that settlement plate assemblies are not damaged or displaced laterally. Each assembly shall be clearly marked and flagged as approved by the Engineer and protective barricades shall be erected around each assembly. Stems deviating from a vertical position, becoming uncoupled or broken shall be repaired or replaced by the Contractor, as directed by the Engineer, at the Contractor's expense.

The Contractor will not be held responsible for repair or replacement of any settlement plate assembly which is made inoperable as a result of instability of the embankment caused by factors, which in the opinion of the Engineer, are beyond the control of the Contractor.

207.15-METHOD OF MEASUREMENT:

ADD THE FOLLOWING:

The quantity of work done will be the actual number of "Settlement Plate Assemblies", installed and maintained in a satisfactory operating condition until final acceptance of the project.

207.16-BASIS OF PAYMENT:

ADD THE FOLLOWING:

The quantities, determined as provided above, will be made at the contract price for for each assembly, which price and payment shall be full compensation for furnishing all material, labor and equipment for proper installation of the assembly, for protecting the assembly, for repair and replacing damaged assemblies and for all other work and incidentals necessary to complete the work.

207.17-PAY ITEM:

ADD THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
207035-001	Settlement Plate Assembly	Each

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 420
SINGLE / MULTIPLE COURSE MICRO SURFACING

420.1-DESCRIPTION:

This section covers the materials, equipment, construction and application procedures for placing Micro Surfacing material for filling ruts and for surfacing existing paved surfaces. The Micro Surfacing is a mixture of a latex-modified asphalt emulsion, crushed mineral aggregate screenings, mineral filler, water and other additives for control of set time in the field. All ingredients are to be properly proportioned, mixed and spread on the paved surface in accordance with this Specification and as directed by Engineer.

420.2-MATERIALS:

Furnish a Micro Surfacing mixture consisting of a properly designed and proportioned blend of polymerized asphalt emulsion, fine aggregate, Portland cement, water and other additives. All materials must be from a WVDOHT approved source. Use materials meeting the following:

420.2.1-Mineral Filler: Portland cement, hydrated lime, limestone dust, fly ash, or other approved filler meeting the requirements of ASTM D 242 shall be used if required by the mix design.

420.2.2-Fine Aggregates, 2FA and 3FA: The fine aggregate used shall be suitable for the particular application and shall be a crushed stone such as granite, slag, limestone, chat, or other high-quality aggregate, or combination thereof. Additionally, on projects with an ADT greater than 3000, the fine aggregate used in the surface course and shall also meet the requirements of the Division of HighwaysWVDOH commercial source list for potential anti-skid aggregate quality specifications. and grading requirements as stated. In addition, aggregates used for surface courses on projects with an ADT greater than 3000 shall be from an approved source identified as having polish-resistant aggregates and considered potential skid-resistant aggregate sources. The aggregate shall be passed over a scalping screen immediately (not prescreened) prior to transfer to the micro surfacing mixing machine to remove oversized material.

Tests		Requirements
Sand Equivalent Value of Soils and Fine Aggregate	AASHTO T176	65 minimum

Soundness of Aggregates by Use of Sodium Sulfate	MP703.00.22	15%max. w/NA2SO4

Material	Percent Passing							
	3/8 in	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
2FA[(a)]	100	90~~85~~-100	65~~50~~-9~~8~~0	4~~5~~0-70~~65~~	30~~25~~-50~~45~~	1~~8~~3-30~~25~~	10-21	5-15
3FA[(a)]	100	70-9~~5~~0	45-70	28-50	19-34	12-25	7-18	5-15

(a) Gradation represents the final blended product.

420.2.3-Asphalt Emulsion-CSS-1hM or CQS-1hM: Polymer Modified Asphalt Emulsion shall be a CQS-1P or CQS-1hP ~~a quick-set, CSS-1hM or CQS-1hM emulsion~~ in accordance with AASHTO M 316 with the following exceptions: ~~the emulsion shall have a minimum 60% residue by distillation;~~ the distillation procedure shall be conducted at 175°C with a 20 minute hold period~~; and the cement mixing test shall be waived~~. The polymer material shall be processed into the asphalt cement or milled into the asphalt emulsion. Post adding to the asphalt emulsion is not permitted. The minimum polymer solids content will be 3.0% based on the residual of the emulsion.

420.2.4-Water: Water shall be potable and free of harmful salts and contaminants.

420.2.5-Additives: Chemical additives may be used to accelerate or retard the break/set of the Micro Surfacing mixture. ~~if required by the mix design~~Appropriate additives, and their applicable use range, should be approved by the laboratory as part of the mix design.

420.3-MIXTURE REQUIREMENTS:

420.3.1-Mix Design: Submit to the Engineer, at least fourteen calendar days before the start of production, a complete mix design prepared and certified by an experienced laboratory. The source for all materials must be shown. Provide a job mix formula (JMF) to the Engineer at the pre-paving meeting showing individual proportions of each material, that when combined, ~~will~~ shall meet the ~~following mix design criteria.~~requirements of AASHTO PP 83, with the exception that the Saturated Abrasion Loss by ISSA TB-144 shall be 2.0g max. A new mix design is required for any change in aggregate or asphalt emulsion source.

~~**Micro Surfacing Mix Design Criteria**~~

~~**ISSA TB-139 Wet Cohesion***~~	
~~30 minutes minimum (set time)~~	~~12 kg-cm min~~
~~60 minutes minimum (traffic)~~	~~20 kg-cm min or near spin~~
~~**ISSA TB-114 Wet Stripping**~~	~~90% min~~
~~**ISSA TB-100 Wet Track Abrasion Loss**~~	
~~One Hour Soak~~	~~50 g/ft2 max~~
~~Six Day Soak~~	~~75 g/ft2 max~~

~~**ISSA TB-144 Saturated Abrasion Compatibility**~~	~~3 g loss, max~~
~~**ISSA TB-113**~~	
~~Mix Time at 77 °F*~~	~~Controllable to 120 sec, min~~
~~Mix Time at 104 °F*~~	~~Controllable to 35 sec, min~~

~~*~~ ~~Check the ISSA TB-139 (set time) and ISSA TB-113 (mix time) tests at the highest temperature expected during construction. For ISSA TB-113 test at 104°F, preheat all ingredients and containers.~~

The JMF must be within the following limits:

Asphalt Binder Content (Residual)	7.0%-8.5%, dry weight, 2FA aggregate 6.5%-8.0%, dry weight, 3FA aggregate
Mineral Filler	0.25%-3.0%, dry weight, of aggregate

420.3.2-Mix Design Format: Provide the following information in the final mix design:

a. Sources of each material
b. Aggregate
    1. Type
    2. Gradation
    3. Sand equivalence
c. Field Simulation Tests
    1. Wet stripping test
    2. Wet track abrasion loss
    3. Saturated abrasion compatibility
    4. Trial mix time at 77 °F and 100 °F
d. Interpretation of results and the determination of a JMF
    1. Mineral filler (minimum & maximum), percent
    2. Water, including aggregate moisture (minimum & maximum), percent
    3. Quantitative effects of moisture content on the unit weight of the aggregate
    4. Mix set additive (if ~~required~~ allowed), percent
    5. Modified emulsion, percent
    6. Residual content of modified emulsion
    7. Residual, percent
e. Mix designer's signature and date

420.4-CONSTRUCTION:

420.4.1-Equipment: Provide safe, environmentally acceptable equipment that can produce a specification product.

420.4.1.1-Mixing Machine: Provide one or more self propelled, front feed, continuous loading mixing machines equipped and operated as follows:

a. A positive connection conveyer belt aggregate delivery system and an interconnected positive displacement, water-jacketed gear pump to accurately proportion aggregate and asphalt emulsion.
b. Continuous flow, twin shaft, multi-blade type pugmill a minimum of 50 inches long.

c. Blade sizes and side clearances that meet the equipment manufacturer's recommendation.
d. Mineral filler feed located to ensure that the proper quantity of mineral filler drops on the aggregate before discharging into the pugmill.
e. Asphalt emulsion introduced within the first one-third of the mixer length to ensure proper mixing of all materials before they exit from the pugmill.
f. Computerized material monitoring system with integrated material control devices that are readily accessible and positioned so the amount of each material used can be determined at any time. The mixer shall be equipped with a back-up electronic materials counter that is capable of recording running count totals for each material being monitored. The mixer shall be equipped with a radar ground measuring device. Each material control device shall be calibrated prior to each mix application and as often thereafter as deemed necessary by the Engineer. The computer system shall have the capability to record, display and print the following information:
    1. Individual sensor counts for emulsion, aggregate, cement, water and additive
    2. Aggregate, emulsion, and cement output in lbs.~~(kgs)~~ per minute
    3. Ground travel distance. The mixer shall be equipped with a Radar Ground metering device
    4. Spread rate in lbs./s.y.~~(kgs/m2)~~
    5. Percentages of emulsion, cement, water and additive
    6. Cumulative totals of aggregate, emulsion, cement, water and additive
    7. Scale factor for all materials
g. Equipped with a water pressure system and nozzle type spray bar to provide water spray ahead of and outside the spreader box when required. Apply water to dampen the surface without resulting in free flowing water ahead of the spreader box.
h. Opposite side driving stations on the front to optimize longitudinal alignment during placement. Remote forward speed control at the back mixing platform so that the back operator can control forward speed and level of mixture in the spreader box.

Use a sufficient number of transports to assure a continuous operation during mix production and application. Use transport units with belt type aggregate delivery systems, emulsion and water storage tanks of adequate size to proportionally mix aggregate delivered by each transport.

Unless otherwise noted in the plans or as approved by the Engineer, truck-mounted batch type machines will only be allowed on small projects (15,000 square yards or less).

Provide a minimum of two units at all times. Schedule these truck-mounted machines so that mixture production is never delayed more than 15 minutes. Stop production anytime there is noncompliance with this requirement.

Calibrate the mixing machines before use. Maintain documentation of calibration of each material metering device at various settings. Supply all materials and equipment, including scales and containers, necessary for calibration. Recalibrate after all changes in aggregate or asphalt emulsion sources. Calibrations shall be done a minimum of once per job.

420.4.1.2-Spreader Box: Attached to the machine shall be hydraulically adjustable (adjustable while applying mixture) type spreader box with a positive screed adjustment for yield control and a positive adjustment for the joint matcher.

Equipped with paddles or augers mounted on adjustable shafts to continually agitate and distribute the mixture to prevent stagnation, excessive build-up, or lumps. Equip spreader boxes with front and rear flexible seals to maintain direct contact with the road. Use a secondary strike off attached to the spreader box to provide a finished smooth surface texture on the final pass or surface pass. Use a drag that produces a uniform finish.

420.4.1.3-Rut Box: Use a steel V configuration screed rut box specifically designed and commercially manufactured to fill ruts to perform all Micro Surface, rut-filling applications. Ensure a mixture spread width of 5 to 6 feet and use a secondary strike off to control crown on the rut box. The rutbox must be equipped with a third strike off that may be used to control texture.

420.4.1.4-Miscellaneous Equipment: Provide hand squeegees, shovels and other equipment as necessary to perform the work. Provide cleaning equipment such as power brooms, air compressors, water flushing equipment, and hand brooms for surface preparation.

420.4.1.5-Lights on Equipment: Equip power brooms, distributors and truck mount spreaders with at least one approved, flashing, rotating or oscillating amber light that is visible in all directions. Equip continuous spreader units with one such light on each side.

420.4.2-Application: Micro Surfacing mixtures shall be applied in a manner to fill ruts, minor cracks and leave a uniform surface with straight longitudinal joints, transverse joints and edges.

When performing multiple course Micro Surfacing, the total application rate shall be a minimum of 30 pounds per square yard by weight of dry aggregate with the final surface course not less than 16 pounds per square yard by weight of dry aggregate.

a. Restored Cross-Section: The construction of the leveling course of Micro Surface, Multiple Course will restore the cross section of the driving lane within 1/4 inch as measured transversely across the pavement with a 7-foot straight edge. The preceding will not apply to any pavement segment that is designed with a quarter crown cross slope or any area of the segment within 6 inches of the edge line, lane line, or centerline.
b. Rutfilling: Rutfilling is required when the rut depth is ½ inch or greater and the pay item is Micro Surface. Rutfilling shall use a Micro Surfacing mix with fine aggregate 3FA applied with an approved rut box for each designated wheel track. A clean overlap and straight edges shall be required between wheel tracks. Each pass of rutfilling shall be limited to a maximum depth of 1 inch. For each 1 inch of applied mix, an additional 1/8 inch crown is required for traffic consolidation. All rutfilling material should cure under traffic for at least twenty four (24) hours before additional material is placed.

Micro Surface, Single Course: A single course shall be applied full lane width in one course to the entire pavement surface including the shoulder if indicated in the contract

documents. Application rate shall be ~~a~~t a minimum of 20 pounds per square yard by weight of dry aggregate for a 3FA mix and 16 pounds per square yard by weight of dry aggregate for a 2FA mix.~~.~~

420.4.3-Temporary Pavement Marking: Shall be in accordance with Section 636.

420.4.4-Pre-paving Meeting: Hold an on-site pre-paving meeting with the Engineer before beginning work to review and discuss the following.

1. Detailed work schedule
2. Traffic control plan
3. Calibration of equipment
4. Mix design previously submitted to the Engineer
5. Equipment inspection, including transport units

420.4.5-Test strip: Test Strip(s) to demonstrate the mixing of materials and placement procedures of each mixing machine to be used on the project. Test strip shall be performed at the beginning of the first day production and on the roadway to be treated. The completed test strip (minimum 500 feet length) shall be reviewed to detect and correct any variances in surface texture, material ratio(s) and finished surface appearance. Additionally, the test strip will be used to establish the target job application rate. The test strip shall be placed in conditions similar to those expected to be encountered during the project. If conditions change (e.g., roadway surface, environmental conditions, day/night) then another test strip shall be performed.

420.4.6-Surface Preparation: Remove all plastic pavement markings using an abrasion method. Remove markings just before the surfacing operation. Work and payment for removal of pavement markings shall follow Section 636.7 of the Specifications.

Micro Surfacing shall not be placed on top of patches, crack seal, Base Repairs, Edge Repairs, or any other asphalt pavement repairs for at least ~~14~~ 30 calendar days. Work and payment for these items shall follow their appropriate sections.

Thoroughly clean the existing surface of all loose materials, vegetation, dirt, dust, mud and other objectionable materials at the time of placing the mixture. Remove animal remains and thoroughly wash the surface before placing the mixture.

The project plans will dictate whether to remove or temporarily cover existing RPMs prior to placement of micro surfacing; payment for removal or covering shall be incidental. When removal is required, the Contractor shall remove RPMs with minimal damage to the pavement surface. Payment for new RPMs shall be in accordance with 663.

Protect drainage structures, monument boxes, water shut-offs, etc., during application of tack coat and mixture.

Apply tack coat according to section 408, except for the following. Mix tack coat with one part emulsion to three parts water. Use the same emulsion as used in the production mixture. Apply the tack coat uniformly, at an application rate of 0.05-0.12 gallons per square yard and without excessive run off. Allow the tack coat to cure before placement of mixture.

Establish 1,000-foot intervals for the entire project, before placing the mixture. Clearly identify and maintain these intervals until project completion.

420.4.7-Surface Quality: Provide a finished surface free from excessive scratch marks, tears, rippling, and other surface irregularities. Do not leave ripples greater than 1⁄8 inch measured by a 10-foot straight edge. Do not leave tear marks greater than 1⁄2 inch wide and 4 inches long, or other marks greater than 1 inch wide and 1 inch long. If the finished surface exceeds the described tolerance, stop work immediately and determine appropriate correct action. Review corrective action with the Engineer before resuming production.

Place longitudinal construction joints and lane edges to coincide with the proposed painted lane lines. Construct longitudinal joints with less than 3 inches overlap on adjacent passes and no more than 3⁄8 inch overlap thickness as measured with a 10-foot straight edge. Place successive passes to prevent ponding of water on the up-slope side of the overlap. Construct neat and uniform transverse joints with less than a 1⁄8 inch difference in elevation across the joint as measured with a 10-foot straight edge. Provide neat and uniform lane edges with no more than 2 inches of horizontal variance in 100 feet. If defective joints or edges are placed, stop work and take corrective action and reviewed by the Engineer.

420.4.8-Traffic Control: Do not allow traffic on the mixture until it has cured sufficiently to prevent pickup by vehicle tires. The new surface must be able to carry normal traffic without damage within one hour of application. Protect the new surface from damage at intersections and driveways. Repair all damage to the mixture caused by traffic. All costs associated with this repair work will be borne by the Contractor. Otherwise Traffic Control will be in accordance with Section 636, and the *Manual on Temporary Traffic Control for Streets and Highways, 2006 Edition*, or as directed by the Engineer.

420.4.9-Weather and Seasonal Limitations:

1. Place the mixture when the air and pavement temperatures are at least 45 °F and rising.~~.~~
2. Do not place mixture in rain or inclement weather or when temperatures are forecast to be below 32 °F within 24 hours of completion of the work.

420.4.10-Quality Control: The contractor shall have at least one employee on the job site who is certified in Slurry Systems through AASHTO's Transportation System Preservation Technical Services Program (TSP2), or through another reputable certification program approved by the Engineer. The contractor shall submit a Quality Control Plan prior to beginning work. Produce a mixture that will meet the JMF and the quality control tolerances. Notify the Engineer immediately if the quality control test results exceed any of the tolerances and stop mixture production. Identify the cause of the excess deviation and determine the corrective action necessary to bring the mixture into compliance. Secure the Engineer's approval before resuming work.

Micro Surfacing Quality Control Tolerances

Aggregate Gradation Tolerances (±) from JMF							
Sieve Size	# 4	# 8	# 16	# 30	# 50	# 100	# 200
Tolerance	5.0%	5.0%	5.0%	5.0%	4.0%	3.0%	2.0%
General Quality Control Tolerances (±)							
Asphalt Cement Content Single Test				0.5 % from JMF			
Asphalt Cement Content Daily Average				0.2 % from JMF			
Application Rate:				2 lb/sq yd (as determined by 1000 ft yield checks)			

Micro Surfacing Quality Control Tolerances

~~Sand Equivalent Test (AASHTO T176)~~	~~7% from JMF~~

Verify and document quality control with the following minimum measures:

1. **Fine Aggregate:** Sample from the project stockpile and test for gradation at one test per 500 tons of aggregate or one test per day of mixture production, whichever is greater.
2. **Asphalt Emulsion:** In the presence of the Engineer, sample of one gallon of emulsion once per production lot. This sample shall be sent to MCS&T Division's Emulsions Lab for testing.
3. ~~**Sand Equivalent Test (AASHTO T176):** Perform a minimum of one test for each project aggregate stockpile.~~
4. **Asphalt Content:** At least three times per day, on a random basis, calculate the percent asphalt content of the mixture using the equipment counter readings.
5. **Application Rate:** At least three times per day, on a random basis, calculate the yield of the course being placed using the equipment counter readings.
6. **Documentation:** Complete a daily report that includes the following information. Complete a separate daily report for each truck mounted machine:
   a. Control section, job number, route, Engineer
   b. Date, air temperature
   c. Control settings, calibration values
   d. Unit weight of emulsion (lbs/gal), percent residue in emulsion
   e. Beginning and ending intervals
   f. Counter readings (beginning, ending, and total)
   g. Length, width, total area (sq yd), weight of aggregate, gallons of emulsion
   h. Percent of each material including asphalt cement
   i. Application rate, (lbs/sq yd), combined application rate, (lbs/sq yd)
   j. JMF (percent Portland cement, percent emulsion, gradations, percent
   k. asphalt cement)
   l. Contractor's authorized signature
   m. Calibration forms
   n. QC aggregate gradations
   o. Aggregate certification
   p. Asphalt emulsion bill of lading
   ~~q. QC sand equivalent test results~~

For Quality Assurance purposes, samples for gradation will be taken from aggregate stockpiles designated by the Contractor for use. The frequency of sampling and testing will be established by the Engineer based upon the Division's current acceptance program and local conditions encountered.

420.5-METHOD OF MEASUREMENT:

"Micro Surface, Single Course" and "Micro Surface, Multiple Course" will be measured by the Square Yard. The quantity will be determined by the Plan Quantity as provided for in the proposal unless otherwise directed by the Engineer.

"Micro Surface, Rut Fill" will be measured by ton of dry aggregate complete and in place.

420.5-~~MEASUREMENT AND~~BASIS OF PAYMENT:

Payment for Micro Surface, Multiple Course includes all materials, equipment, labor for preparing the surface, placing the micro surfacing mixture and complying with all requirements. The placement includes application of a ~~rut-filling and/or~~ leveling course and a final surface course for full width coverage as specified in the contract documents.

Payment for Micro Surface, Single Course, includes all materials, equipment, labor for preparing the surface, placing the Micro Surfacing mixture and complying with all requirements. The placement includes application of a single course of mixture for full width coverage as specified in the contract documents.

~~The completed work as measured will be paid for at the contract unit price for the Items detailed in Section 420.6.~~

Materials placed in stockpiles or on the road not meeting the required tolerances may be accepted at a reduced price if it is not considered detrimental to the life of the treatment by the Engineer in accordance with ISSA A-143, Section 3. The following price adjustment schedule will be used when appropriate and applied accordingly to representative material:

(i.) One percent reduction in the bid price per square yard for each one-tenth percent the asphalt content is out of tolerance.

(ii.) One-quarter percent price adjustment in the bid price per square yard for each one percent that the aggregate gradation is out of the job mix range.

(iii.) One and a half percent reduction in the bid price per square yard for application rate dropping below the established rate by more than 2 lb/sq yd. If the application rate drops below the established rate by more than 3 lb/sq yd, the material will not be accepted and measures will need to be taken by the contractor to correct for such deficiency

Price adjustments under 1, 2, and 3 above shall apply concurrently; however, price adjustment will not apply in the event the material is rejected. The disposition of rejected material will be subject to the approval of the Engineer

420.6-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
~~420001-*~~	~~Micro Surface Multiple Course~~	~~Square Yard (Meter)~~
420002-*	Micro Surface, Single Course	Square Yard ~~(Meter)~~
420003-*	Micro Surface, Multiple Course	Square Yard (Meter)
420005~~3~~-*	Micro Surface, Rut Fill	Ton ~~(TN)~~

*Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 503
SEALING CRACKS IN CONCRETE PAVEMENT

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

503.1-DESCRIPTION:

This work shall consist of the cleaning and sealing of cracks in concrete pavement in the manner and subject to the conditions and regulation prescribed. The location of the cracks to be sealed shall be shown on the plans or as directed by the Engineer.

503.2-MATERIALS:

The sealant shall be in accordance with Section 708.3.

~~The joint back up~~ Crack sealant filler or backing material shall be in accordance with Section 708.4.2, shall meet the requirements of the Sealant Manufacturer, and shall be appropriate for outdoor applications.

CONSTRUCTION METHODS

Old filler and foreign material in the cracks shall be removed. The cracks shall then be sealed as prescribed. Other means and/or methods recommended by the Sealant Manufacturer and approved by the Engineer may be used.

503.3-BLANK

503.4-PREPARATION OF MATERIAL BEFORE USE:

Before charging the compound into the melting unit, the unit shall be free from all foreign material. If the type of heater to be used requires that the sealing material as shipped, be cut into smaller pieces before melting, the method used is subject to approval by the Engineer.

The heating kettle used for melting sealing materials shall be of the indirect heating or double boiler type, using oil as the heat transfer medium. It shall have a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath. Other methods of indirect heating approved by the Engineer may be used. A positive means of controlling the temperature of the heat transfer medium at all points in the system shall be incorporated in the heater. Sealing

material shall be uniformly heated until the pouring temperature recommended by the Sealant Manufacturer is reached. Should the maximum recommended pouring temperature be exceeded, the material will be rejected. The material shall be poured as soon as possible after the pouring temperature is reached. Only sufficient material for the day's operation shall be heated each day. Other means and/or methods recommended by the Sealant Manufacturer and approved by the Engineer may be used.

503.5-PREPARATION OF ~~JOINTS~~ CRACKS FOR SEALING:

Cracks should be widened with a ~~crack~~ saw to a minimum width of ½~~"~~ inch ~~(16 mm)~~ and to a depth necessary to provide a 1:1 width to depth ratio including room for the ~~backer rod~~ backing material, if necessary. Cracks greater than ½ inch width, do not require saw cutting. Unless otherwise noted, sealing concrete pavement joints shall be applied as outlined in Section 510 and cracks greater than 1 inch width shall be repaired as outlined in Section 507.

The cracks shall be thoroughly cleaned of all loose scale, dirt, dust, other foreign matter, old sealant and loosely stuck particles of mortar and aggregate, so that dry, sound, and clean surfaces result. The use of any tool which results in damage to the pavement is prohibited. Just prior to the actual sealing operation, the crack shall be thoroughly blown out with an air jet having sufficient volume and pressure to remove any loose material left by the cleaning operation. After the final cleaning, the ~~back-up~~ backing material, if necessary, shall be inserted into the crack in accordance with the Manufacturer's recommendations to provide the correct shape factor for the sealant.

503.6-EQUIPMENT FOR APPLYING SEALER:

The equipment used for the placing of sealing material in the cracks may consist of conventional hand pouring pots, individual mechanical pouring kettles mounted on wheels with a pouring shoe, or heating units from which material may be discharged into the ~~joint~~ crack through the use of flexible lines and suitable shoes. Any heat, which it may be necessary to apply to sealing material after it leaves the main heating unit, shall be applied by indirect and controlled methods as specified in 503.4. No direct heat will be permitted on the pouring unit in order to meet field controls set forth below. Any method of placing sealing material, which results in compliance with the following requirements, will be satisfactory.

503.7-PLACEMENT REQUIREMENTS:

~~After insertion of the back-up material and prior to becoming contaminated, t~~The crack shall be sealed in accordance with the Sealant Manufacturer's recommendations. At the time of sealing, the crack faces shall be dry and dust free. The sealant shall be introduced into the crack in a continuous uniform operation to properly fill and seal the crack from the bottom upward in order to avoid trapping any air bubbles. The crack shall be sealed to within 1/8 to ¼ inch ~~(3 to 6 mm)~~ below the pavement surface. Traffic shall not be allowed on the sealed joint for the minimum time recommended by the Sealant Manufacturer after placement, unless otherwise approved by the Engineer.

Sealant shall never be applied to frozen, dirty, wet, or damp concrete or during inclement weather conditions. Sealant shall not be placed in the cracks unless the temperature of the pavement is 40° F ~~(4° C)~~ or higher unless approved by the Engineer.

503.8-METHOD OF MEASUREMENT:

The quantity of work done will be measured in linear feet ~~(meters)~~ of "Sealing Cracks", when the item below is included in the contract.

503.9-BASIS OF PAYMENT:

The quantity of work, as described above, will be paid for at the contract unit price bid for the item below, which price and payment shall be full compensation for furnishing all the materials and doing all the work prescribed in an acceptable manner, including all the labor, tools, equipment, supplies, and incidental items necessary to complete the work.

503.10-PAY ITEM:

ITEM	DESCRIPTION	UNIT
503001-*	Sealing Cracks in Concrete Pavement	Linear Foot ~~(Meter)~~

* Sequence number

July 21, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 507
CRACK AND POTHOLE REPAIR

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

SECTION 507
LARGE CRACK AND POTHOLE REPAIR OF CONCRETE PAVEMENT

507.1-DESCRIPTION:

This work shall consist of repairing large cracks and pothole repair of an existing concrete pavement surface ~~prior to resurfacing with hot-laid asphalt concrete in accordance with these specifications~~. The locations of these repairs shall be as shown on plans or as specified by the Engineer.

507.2-MATERIALS:

The materials shall conform to the requirements of the following sections.

MATERIAL	SECTION
Fine Aggregate	702.3
~~Hot-Mix~~ Asphalt Base Course	401
Performance Graded Binder	705.5
Tack Coat	408

507.3-CONSTRUCTION METHODS:

Cracks 1 inch or less wide shall be repaired, as outlined in Section 503. ~~All~~ Existing concrete pavement cracks in excess of 1 inch~~. (25 mm)~~, but less than 3 inches ~~(75 mm)~~ in width, shall be thoroughly cleaned of all dirt, debris, loose or other foreign or unstable material and filled with a mixture of sand and asphalt. The asphalt content shall be 5 to 10%. Asphalt mixture shall be applied at a temperature range of 250° to 325° F ~~(120° C to 162° C)~~.

All cracks in excess of 3 inches ~~(75 mm)~~ and all potholes greater than 1 inch~~. (25 mm)~~ in depth, shall be thoroughly cleaned of all dirt, debris, loose or other foreign or unstable material. After cleaning, the cracks and potholes are to be tacked, in accordance with Section 408 of the Specifications, and filled with asphalt ~~concrete~~ base course material in accordance with 401 or as approved by the Engineer.

~~Prior to resurfacing, a~~All cracks and potholes are to have the same finished grade as the adjacent surfaces.

507.4-METHOD OF MEASUREMENT:

The quantity of work done for large crack and pothole repair will be measured by the actual number of tons ~~(megagrams)~~ of material used for crack and pothole repair and shall include cleaning, tack material, asphalt, sand, asphalt concrete base course complete in place and accepted.

507.5-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit price bid for the item listed below, which price 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.

507.6-PAY ITEM:

ITEM	DESCRIPTION	UNIT
507002-*	Large Crack and Pothole Repair of Concrete Pavement	Ton ~~(Megagram)~~

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 601
INJECTION OF GROUT INTO THE GROUND

601.1-GENERAL:

ADD THE FOLLOWING:

601.1.1-Description: The Contractor shall furnish all materials, tools, and labor necessary for injecting the materials as directed by these Specifications.

601.1.2-Definitions: The following definitions apply in the interpretation of these Specifications:

Zone: A zone is the horizontal area influenced by the injection into a hole.

Void: A void is any subsurface opening resulting from the removal of coal from the coal seam. Voids may be at the coal seam level or above.

Gob: Gob is a mixture of materials found at mine level that consists of roof shales and other rock materials that have fallen or have been placed in a void.

Coal Pillar: Coal pillar is an un-mined block of coal remaining in the coal seam.

Stage: A stage is a vertical subsurface injection interval, which may include all, or part of the drill hole length.

Gravity Injection: Gravity injection is the method used to place grout or concrete into the injection hole without pressure packers being used. The necessary materials are placed through a pipe (supply and/or tremie) at the specified interval of DOT under the action of gravity (gravity flow). Pumping will be required to place concrete and grout at mine level to overcome friction in the injection hoses and pipes.

Overburden: Overburden includes soil and rock overlying the mined coal seam.

Take: Take is the volume of material injected into a specified interval of an injection hole.

Mine Workings: The vertical interval that corresponds to the mined portion of the coal. This interval starts at the base of the coal and extends to the mine roof.

Closure: A closure (split spacing) method for secondary injection will be used in areas as determined by the Engineer. Closure holes will normally be located midway between holes injected previously.

601.2-MATERIALS:

ADD THE FOLLOWING:

1. Grout: Grout shall be composed of a flowable mixture of cement, fly ash and water, with the possible addition of an accelerator. Concrete shall be composed of a mixture of coarse aggregate, cement, fine aggregate, fly ash, and water. Chemical admixtures may be used to obtain the required slump or to maintain the required workability or flowability if included in the design mix testing. For an on-site batch plant, sufficient quantities of materials shall be stored at or near the site of the work so that grouting or concreting operations will not be delayed by shortage of materials. Any on-site storage and delivery of fly ash and cement shall be performed so as to minimize dust. The contractor must maintain a record of all materials delivered to the site and provide the Engineer with a copy of all deliveries on a daily basis.

   The contractor, at his expense, will dispose of all materials unacceptable for use and all materials left after grouting is complete, in accordance with NEPA regulations.

2. Water: The water used in grout and concrete shall be clean and free from injurious amounts of sewage, oil, acid, alkali, salts, organic matter or any other foreign solids, and shall be furnished by the Contractor. The water used shall meet the requirements of ASTM C94. Whenever the outside air temperature is below 20° F, the Contractor shall heat all water for mixing, cleaning and flushing. The final mix temperature shall range from 40°F to 80°F, with the water temperature not exceeding 140° F at the time of mixing.

3. Cement: Cement used in grout or concrete shall conform to the requirements ~~of ASTM C150, "Portland Cement," Type II~~ of 701.1 or 701.3 of the Standard Specifications. The Contractor shall furnish and store cement so that it will not deteriorate from moisture, weather or other causes.

   Cement that has been in storage more than two months shall not be used for concrete or grout. The use of bulk cement will be permitted provided the Contractor provides methods of handling; transporting, storage and measuring that are satisfactory to the Engineer.

   If sacked cement is used on the project, it shall be used in the chronological order in which it was delivered on the job to prevent undue aging after delivery. Store each shipment of cement so that it may readily be distinguished from other shipments. Use only cement free from lumps due to warehouse set. No additional payment will be made for screening or for old cement, which may be rejected by Engineer.

4. Fine Aggregate: Fine aggregate shall be sand-sized and consist of hard, dense, durable rock fragments and shall meet all requirements of ASTM C33.

5. Coarse Aggregate: Coarse aggregate shall consist of hard, dense, durable fragments and shall meet the grade requirements of AASHTO Number 8 (one-half inch to #16) and conform to all requirements of ASTM C33.

6. Fly Ash: Type F fly ash resulting from combustion of pulverized coal supplied and handled by the Contractor shall meet the following requirements:
   a. A Maximum Loss on Ignition (LOI) of 12 percent.
   b. A minimum of 40.0 percent Silicon Dioxide (SIO_2).
   c. A minimum of 15.0 percent Aluminum Oxide (AI_2O_3).
   d. Not more than 5.0 percent Acid Soluble Sulfate (SO_3).
   e. Not more than 3.0 percent Magnesium Oxide (MgO).

7. Accelerator: The use of an early set accelerator may be added to the mixes when directed by the Engineer. All accelerator products shall conform to ASTM C494.

8. Optional – High Range Water Reducer: The use of a water reducer may be added to the concrete mix only with the approval of the Engineer. All water reducing products shall conform to ASTM C494. There will not be additional payment for the use of water reducers.

9. Optional – Set Retarder: The use of a set retarder may be added to the mixes only with the approval of the Engineer. All set retarding products shall conform to ASTM C494. There will be no additional payment for the use of set retarders.

601.3-GROUT AND CONCRETE MIXES:

1. Grout Mix: The water-cement-fly ash ratio of the grout mix will be determined by the Contractor with the approval of the Engineer. The resultant grout must be flowable and have a minimum unconfined compressive strength of 350 psi after seven days of curing and 500 psi after 28 days of curing. The Contractor will be responsible for insuring that the grout mix will meet the strength requirements and that the mix can be pumped through the injection pipe (both the supply lines from the pump to the injection hole and tremie pipe) to be utilized on this project. Grout mixes may be varied to meet characteristics of each boring, with Engineer approval, but each case must meet the minimum unconfined compressive strength requirements and shall not exceed the water/cement ratio of the design mix. The grout shall have a flow cone value ranging from 30 to 60 seconds as determined by ASTM C939.

   Twenty-eight day compressive strength test specimens shall be obtained and sampled according to ASTM Test Designation C31 for a minimum of each 50 cubic yards or daily fraction thereof. The Engineer may require samples to be taken from any truckload of grout.

   A written grout mix, using weights of materials shall be submitted to Engineer for approval a minimum of five working days prior to injection operations. Even upon approval, it remains the Contractor's responsibility to ensure the minimum compressive strength requirements are achieved.

2. Concrete Mix: Concrete shall be composed of a mixture of water, cement, sand, fly ash, fine aggregate, and coarse aggregate. Concrete must have a mix proportioned for a four to

six inch slump as measured in ASTM Test Designation C143, or otherwise, will be directed by the engineer. The Contractor shall be responsible for insuring that the design mix for concrete can be pumped through the injection pipes (both the supply lines from the pump to the injection hole and tremie pipe) that he intends to utilize for the project. All concrete placed shall have a minimum unconfined compressive strength of 350 psi after seven days of curing and 500 psi after 28 days of curing, and the water/cement ratios shall not exceed those of the design mix for each design slump. Slump shall be maintained in the required range even after pumping.

3. Mix Designs: All concrete and grout mix designs to be used by the Contractor will be subject to review and approval of the Engineer. The use of grout or concrete will be at the discretion of the Engineer. The flow rate of the grout will also be at the discretion of the engineer. The Contractor shall submit to the Engineer the proposed mix designs along with sufficient test data using the proposed sources of mix components to verify strength parameters prior to the initiation of injection operations. This design mix testing shall include the corresponding slump and fluidity test results for the design mixes. If, during injection operations, the testing indicates that required strengths are not being achieved, the design mix proportions are not being achieved, or the required slump is not being achieved, then the Contractor shall modify the mix proportions, strengths, and slump.

   All unconfined compressive strength requirements of this Specification are based on testing according to ASTM C39 of cylindrical samples prepared according to ASTM C31.

   If the Contractor desires to mold and test cube samples of grout according to ASTM C109 to assist in quality control during injection, he must also present the test results of unconfined compressive strengths of cube samples of the design mixes prior to the initiation of grouting and concreting operations. These test results will be used by the Engineer to determine if and how much the design strength measured for cube samples must be increased to determine that the specified unconfined compressive strength based on cylindrical samples is being achieved.

   The Contractor shall submit his batching sequence, forming, placing, curing, and testing procedures to the Engineer for review 7 working days prior to casting. The mixing sequence shall include the order and time of introduction of the materials, mixing time and QA/QC procedure for the verification of the mix uniformity.

601.5-EQUIPMENT:

1. All equipment required for mixing and injecting grout and concrete shall be furnished by the Contractor. The power supply and equipment and layout thereof shall meet all applicable Local, State and Federal requirements, regulations and codes, including those related to safety.
2. The Contractor can use a premixed grout delivery service or an on-site batch mixing facility. On site batch plants require compliance with these specifications. In the area of fly ash storage, a sprinkler system for dust control is required. In either case, the grout shall be well mixed and shall be free of hardened grout or foreign materials larger than would pass a Number 16 U.S. Standard screen. The Contractor shall provide all necessary pumps, mixers, compressors, tanks, meters, valves, hoses, pipes, fittings, tools, and other miscellaneous items to provide a continuous supply of grout and to maintain accurate control and measurement. The grout plant must be capable of providing 50 cubic yards of

grout per hour to each operating pump. The tremie pipe, when required, shall be metal or plastic, no smaller than three (3) inches in diameter, and stiff enough to maintain the tip below the level of grout during placement. The type and diameter of grout supply pipe to be used shall be determined by the Contractor and approved by the Engineer. If, at any time, it is determined that the pipe is of insufficient diameter, then the Engineer will direct the Contractor to use a larger diameter pipe.

3. The equipment used to mix grout and concrete shall have suitable metering devices to accurately, continuously measure the proportions of all components of the mix, including, water at the time of injection. The water meter shall be a non-resettable, continuous flow meter and must meet the approval of the Engineer.
4. All flow measurement and mix-proportioning equipment shall have a recent calibration and shall be field calibrated periodically during the project as directed by the Engineer. If a grout plant is utilized during construction, calibration will be required on a weekly basis. All equipment must be in good working condition.

601.5-CONSTRUCTION METHODS:

1. The Contractor shall perform periodic depth soundings during grout and concrete injection operations to determine the levels of injected materials in the holes, and to maintain the discharge points of the injection pipes below the surface level of the grout or concrete.
2. Vertical and angled holes are as defined on the Contract Plans and are located throughout the area to be stabilized. In general, grout is to be injected into the existing voids. Concrete may be injected into the voids as directed by the Engineer.
3. Injection sequences, injection materials, and injection procedures for each hole will be determined by the Engineer. In general, grout or concrete shall be injected continuously into a hole until the hole fills to the base of the casing, or until the Engineer directs the Contractor to terminate injection. The Engineer may terminate injection in any hole at any time that the Engineer determines is appropriate to attempt to limit undesirable loss of injection materials outside the area of stabilization. A minimum period of 12 hours shall elapse between subsequent injection stages in each hole.
4. Injection shall be performed using the gravity injection technique described herein, or pressure grouting. Prior to injecting any material into the mine, the Contractor shall determine the presence or absence of water in the mine (void). Where injection is to occur in water, and or collapsed material, tremie-grouting using a grout or concrete supply pipe shall be used. Pressure grouting of overburden materials will be performed with pressures not exceeding 40 psi. The grout or concrete supply pipe shall be extended to the bottom of the hole, filled with grout or concrete and slowly withdrawn from the borehole.
5. Additional material shall be pumped into the pipe as it is withdrawn such that the pipe is always full, and the bottom of the pipe is always maintained within the grout or concrete being placed. Free fall of grout or concrete through the injection stage is prohibited where injection occurs in water.
6. Grouting shall begin 15 ft below the pile tip and continue to the top of rock unless large takes are encountered in which case the mix may be thickened. If directed by the Engineer, fine or coarse aggregate shall be placed in the hole by shoveling or other methods approved by the Engineer while grouting continues.
7. No flushing of water down the hole or into the mine will be allowed once injection has commenced in that borehole. The Contractor shall inject material in such a way as to not

coat or foul the borehole until mine-level voids are filled, and the injected material backs up into the borehole.

8. Concrete shall be placed within the following time limits after the introduction of the cement:
   a. 90 minutes when the ambient air temperature is 80° F or less.
   b. 60 minutes when the ambient air temperature is over 80° F.
9. Once the injection holes have been grouted or concreted to the top of rock, the grout or concrete has been permitted to set, and found not to have settled significantly, then the casing shall be removed. Concurrently with or immediately after removal of the casing, the remaining open hole in the overburden shall be filled with grout to the ground surface. If grout settlement occurs later, the hole shall be refilled to the ground surface with aggregate. Aggregate used to fill the holes shall be that specified in Section 601.2 of this special provision.
10. The supply line will be cleaned at the conclusion of each day's injection with a "pig" or 'rabbit'. The cleaning of the supply line by flushing with water into the injection hole will not be allowed.
11. After a hole has been drilled, all cuttings will be removed that same day and the area around the hole will be returned to the condition it was in before drilling.

601.6-TESTING:

1. The Contractor shall prepare grout and concrete test cylinders in accordance with ASTM C31 at a rate of four for each 50 cubic yards placed or any fraction thereof. The Engineer reserves the right to require preparation of cylinders from any batch. The samples shall be obtained at the injection hole location or at the batch plant as directed by the Engineer. The Contractor shall have the cylinders tested according to the ASTM C39 at 3 days, 7 days, and 28 days cure and one for a spare. The Contractor shall report results to the Division in writing within 48 hours of completion of each test. Test cylinders shall be prepared at each plant or field change of the water-cement-fly ash ratio. The slump of each load or batch of concrete shall be determined according to ASTM C939. The Contractor upon request from the Engineer shall test the slump or fluidity of the mix. A record of all test results shall be made. The cost of this testing and reporting shall be the responsibility of the Contractor.
2. If the Contractor desires to test cubes of grout and has previously completed testing as discussed under Section 601.3 of this special provision, then mold and test cube samples of grout are acceptable at the frequency specified above for cylinders in accordance with ASTM C109.

601.7-DOCUMENTATION:

1. The Contractor shall maintain daily labor and material records for subsurface injection operations on forms suitable to the Engineer. These records shall include actual measured quantities of the injection material components, including water.
2. The Contractor shall record the quantities of concrete and grout injected into each injection hole, on forms approved by the Division
3. Daily records of labor, mix proportions, slump measurements, fluidity measurements, water removed from the mine and injection quantities shall be submitted to the Engineer within one day of injections.

4. Compressive strength test results shall be submitted within 35 days of the sample date from a Division approved laboratory. The Laboratory forms shall bear the laboratory name, address, sample designation, sample date, test date, and original signature of a certified lab analyst. Sample test results which fail to meet required strength criteria, as set forth in the contract and these specifications, may be subject to nonpayment for the volume of material represented by the deficient sample, following a review by the Division.

601.14-METHOD OF MEASUREMENT:

Payment for purchasing, handling, and placing concrete, and all associated costs will be based on the number of cubic yards of concrete injected. This shall include purchase, mixing and transportation of high and low slump concrete from the batch plant or supplier to the job site. The volume submitted for payment cannot exceed the material dry weight(s) delivered and proportioned per cubic yard based on the mix design submitted. Concrete placed in installed monitoring wells shall be included in this measurement section.

Payment for purchasing, handling and placing grout, and all associated costs will be based on the number of cubic yards of grout injected. This shall include purchase, mixing and transportation of grout from the batch plant or supplier to the job site. The volume submitted for payment cannot exceed material dry weight(s) delivered and proportioned per cubic yard based on the mix design submitted.

Payment for supplying, handling and placing coarse aggregate will be made based on the number of tons of coarse aggregate placed. This shall include the cost of all material, labor, transportation, tools and equipment and associated costs required for purchasing, handling and placing the coarse aggregate into the boreholes. Any work required to clear boreholes where the coarse aggregate has "bridged" or otherwise blocked the boreholes is also included as part of this item.

The concrete quantities shown on the plan, measured by the cubic yards, are for Contractor's information only.

601.15-BASIS OF PAYMENT:

The quantity, determined as provided above, will be paid for at the contract unit price bid for this item, which price 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, field laboratory, supplies and incidentals necessary to complete the work.

601.16-PAY ITEM:

ITEM	DESCRIPTION	UNIT
601041-001	Injected Grout	Cubic Feet

September 1, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 628
EXPLORATORY DRILLING AND SAMPLING

ADD THE FOLLOWING:

628.1-DESCRIPTION:

This work shall include exploratory drilling prior to the installation of each pile, at each pile location at the abutments and as directed by the Engineer.

This work shall also include exploratory drilling after excavation of spread footings at piers, at locations indicated in this specification and as directed by the Engineer.

628.2-MATERIALS:

See subsections 628.4.1 (g) and 628.4.2 (c) for grout requirements.

628.3-EXPLORATORY DRILLING EQUIPMENT:

628.3.1-Equipment for Exploratory Drilling at Abutment Pile Locations: A rotary drill capable of drilling a minimum 2" diameter hole in the limestone bedrock to the depths indicated in this specification shall be used. Cutting removal may be by air or water circulation. The equipment shall have a mechanical or hydraulic feed and is subject to the approval of the Engineer. Percussive drilling equipment is not permitted.

628.3.2-Equipment: for Exploratory Drilling at Pier Foundations: A percussive or rotary drill capable of drilling a minimum 2" diameter hole in the limestone bedrock to the depths indicated in this specification shall be used. Cutting removal may be by air or water circulation. The equipment shall have a mechanical or hydraulic feed and is subject to the approval of the Engineer.

628.4 EXPLORATORY DRILLING PROCEDURES:

628.4.1 Exploratory Drilling Procedure at Abutment Pile Locations:

a. The Contractor shall notify the Engineer at least 3 working days prior to performing the exploratory drilling so that arrangements can be made to have a the Engineer observe the exploratory drilling.
b. Drill a hole at each pile location. Provide access to the Engineer so that samples, drill cuttings and drill behavior can be readily observed.
c. Borings shall be extended a minimum of 15' below the top of rock at abutment 1 and 5 feet below the top of rock at abutment 2. At abutment 1 the hole shall extend to a minimum of 30 feet below the bottom of footing elevation even if rock is encountered less than 15 feet below the bottom of footing elevation
d. If the hole fails to stay open, the contractor may install a temporary casing. This casing must be removed after completion of the hole.
e. No pay will be made for borings abandoned or lost before the specified depth is reached except as specified in Section 205.1.4.1 (False Starts) of the Core Boring Contract Document (https://transportation.wv.gov/highways/engineering/files/CORE%20BORING%20CONTRACT%20revised%20april%202016.pdf). The Contractor is advised that limestone boulders may be encountered and will not be considered "unusual" per Section 205.1.4.1.
f. The Engineer will identify the required pile tip elevation for each pile based on the results of each boring. If the required tip elevation can not be achieved by driving the pile, pre-drilling for the pile will be directed.
g. After completion of the exploratory boring and approval of the Engineer, tremie grout the boring with grout having a minimum compressive strength of 3000 psi. Grout may contain sand and fly ash but shall be pumpable to the bottom of the boring. Grout shall be placed from the bottom of the borehole to the pile tip elevation identified by the Engineer. The remainder of the boring shall be backfilled with concrete sand meeting the requirements of Section 702 of the Standard Specifications.

628.4.2-Exploratory Drilling Procedure at Pier Spread Footings:

a. Excavate to the proposed footing elevation and prepare in accordance with Section 212.8 of the Standard Specifications prior to performing exploratory drilling. Notify the Engineer at least 3 working days prior to performing the exploratory drilling so that arrangements can be made to have the Engineer observe the exploratory drilling. The Engineer will inspect the exposed bearing strata and will direct the location and depth of exploratory holes. A minimum of 6 holes, to a depth of 35 feet each, is required under each footing.
b. Drill the directed holes in the presence of the Engineer. Provide access to the engineer's representative so that cuttings and drill behavior can be readily observed.
c. After completion of the boring and approval of the engineer, tremie grout the boring with grout having a minimum compressive strength of 3000 psi. Grout may contain sand and fly ash but shall be pumpable to the bottom of the boring. Regrout any borings where the grout has settled below the footing elevation.

628.5-METHOD OF MEASUREMENT:

The quantity of drilling work done will be based upon the length of borings taken below the existing ground surface, as indicated by the below ground drill rod lengths, and as determined by the Engineer. Coring and sampling methods will be measured as one item. Grouting the completed borings is included in the unit price.

628.6-BASIS OF PAYMENT:

Payment for Exploratory Drilling and Sampling will be made at the contract unit price bid for this item, including coring, drilling, sampling, grouting, and incidentals necessary to complete the work.

628.7-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
628004-001	"Exploratory Drilling and Sampling, Pile Driving"	Lineal Foot
628004-001	"Exploratory Drilling and Sampling, Spread Footings"	Lineal Foot

August 31, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 604
PIPE CULVERTS

604.12-INSPECTION AND ACCEPTANCE:

604.12.3-Testing of Pipe:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

A post installation camera/video inspection of pipe culverts and laser/mandrel deflection inspection of flexible pipe shall be conducted by the Contractor on all pipe culverts that meet the following requirements:

1. Cumulative total of 200 linear feet ~~(70 m)~~ or more of pipe culverts on project; and
2. Project located on NHS routes

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 607
GUARDRAIL

DELETE THE LAST PARAGRAPH OF SUBSECTION 607.1.

607.1-**DESCRIPTION:**

This work shall consist of the construction or reconstruction of guardrail in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Plans or established by the Engineer.

The types of guardrail are designated as follows:

Type 1:	Galvanized Steel Deep Beam Type Guardrail or Zinc-Aluminum-Magnesium Alloy-Coated Steel Deep Beam Type Guardrail
Type 2:	Blank
Type 3:	Blank
Type 4:	Blank
Type 5:	Galvanized Steel Double-Faced Guardrail (Deep Beam Type) or Zinc-Aluminum-Magnesium Alloy-Coated Steel Double-Faced Guardrail (Deep Beam Type)

All installations of Type 1 & 5 Guardrail will be classified according to one of the designations specified. The guardrail class will be indicated in the pay items and on the Plans,

Class I:	6 feet - 3 inches (1 905 mm) post spacing with blocks
Class II:	12 feet - 6 inches (3 810 mm) post spacing with blocks
Class III:	12 feet - 6 inches (3 810 mm) post spacing without blocks.
Class IV:	3 feet - 1½ inches (952 mm) post spacing without blocks.
Class V:	3 feet - 1½ inches (952 mm) post spacing with blocks.

The construction of the guardrail shall include the complete furnishing, assembling and erecting of all component parts and materials at the location shown on the Plans or directed by the Engineer.

~~A Modified Cut Slope Terminal shall consist of supplying and installing additional length guardrail posts, an additional W-beam guardrail section (bottom beam), and standard guardrail cut slope terminal components~~

September 13, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 607
GUARDRAIL

607.1-DESCRIPTION:

ADD THE FOLLOWING SUBSECTION:

607.1.1-Test Level (TL)-5 Guardrail Barrier System: This work shall consist of furnishing and erecting an open, semi-rigid longitudinal barrier system that allows drainage and plowed snow to pass. The furnished system shall have a letter of eligibility from FHWA for a MASH 2016 compliant system tested at TL-5 and shall be on the Division's Approved Product List. The TL-5 Guardrail Barrier System shall be fabricated and constructed to the lines and grades shown on the Plans or established by the Engineer.

607.2-MATERIALS:

ADD THE FOLLOWING PARAGRAPH TO THE SUBSECTION:

The TL-5 Guardrail Barrier System using Thrie Beam and W-Beam rail shall meet ASTM A1011steel Grade 80. The galvanizing of all steel components shall meet ASTM A123. No component shall be permitted to be welded after galvanization.

607.6-METHOD OF MEASUREMENT:

ADD THE FOLLOWING SENTENCE TO THE END OF FIRST PARAGRAPH:

The quantity of work done will be measured in linear feet of TL-5 Guardrail Barrier System as defined by the limits of the detail in the Plans for Longitudinal Barrier Section, Load Transfer

Section and Drop Down & Anchorage, complete in place and accepted, measured along the face of the rail to the limits as shown in the Plans.

607.7-BASIS OF PAYMENT:

ADD THE FOLLOWING TO THE SUBSECTION:

The quantities of TL-5 Guardrail Barrier System including Longitudinal Barrier Section, Load Transfer Section, and Drop down & Anchorage will be measured and paid for at the contract unit prices bid for the items listed below, which prices and payments shall constitute full compensation for rails, posts, hardware and any miscellaneous items required by the system and for the furnishing, packaging, and delivery to the designated site and any other incidentals necessary for the Division to take delivery of the Materials Only items. The bolts at the splices of each end of the Load Transfer Section-Materials Only shall be provided and packaged with said pay item.

607.8-PAY ITEMS:

ADD THE FOLLOWING TO THE TABLE:

ITEM	DESCRIPTION	UNIT
607019-005	Longitudinal Barrier Section	Linear Foot
607019-010	Load Transfer Section	Linear Foot
607019-015	Drop Down & Anchorage	Linear Foot
607019-006	Longitudinal Barrier Section-Materials Only	Linear Foot
607019-011	Load Transfer Section-Materials Only	Linear Foot
607019-016	Drop Down & Anchorage-Materials Only	Linear Foot

~~September 13, 2021~~ October 18, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 610
CURBS, COMBINATION CURBS AND GUTTERS, AND MEDIANS

610.1-DESCRIPTION:

This work shall consist of the construction or resetting of curbs, combination curbs and gutters, and medians in accordance with these Specifications and in reasonably close conformity with the lines, grades, dimensions, and locations shown on the Plans or established by the Engineer.

The types of curbing, combination curbs and gutters, or medians are as follows:

1. Plain Concrete Curbing
2. Integral Concrete Curbing
3. Combination Concrete Curb & Gutters
~~4. Reflecting Concrete Curbing~~
~~5.~~4. Asphalt Curbing
5. Median~~s~~ Barrier
6. Raised Concrete Traffic Islands

610.2-MATERIALS:

Except as provided below, materials shall meet the requirements of the following Subsections of Division 700:

MATERIAL	SUBSECTION
Asphalt Emulsion for Paint Coat	705.4 or 705.11
Asphalt for Tack Coat	705.4 or 705.11
Expansion Joint Filler Preformed	708.1
Joint Sealing Material	708.3 or 708.4
Joint Tie Bolt Assembly	709.7
PG Binder for Asphalt Curb	705.5*
Reinforcing Steel	709.1, 709.4

* Standard grade specified for local area unless indicated otherwise on the Plans.

Concrete shall meet the requirements of 601, Class B, or 501. ~~In addition, the requirements in 610.4 shall govern when reflecting concrete curbing is called for.~~

Concrete, asphalt mixes, and manufactured curbing materials will be subject to inspection and tests at the plants for compliance with quality requirements.

All materials will be subject to inspection for acceptance as to condition at the latest practicable time the Engineer has the opportunity to check for compliance prior to or during incorporation of materials in the work.

Asphalt curbing component materials shall meet the applicable requirements of Section 401 and the composition of the mix shall meet the following Table 610.2:

TABLE 610.2 (MASTER RANGE CRITERIA)

½ inch (12.5 mm)	100
3/8 inch (9.5 mm)	80 - 100
# 4 (75 mm)	50 - 80
# 8 (2.36 mm)	30 - 60
# 16 (1.18 mm)	20 - 50
# 30 (600 µm)	12 - 36
# 50 (300 µm)	5- 25
# 200 (75 µm)	3- 9
% Asphalt	4 - 10

No mix design approval will be required for asphalt curbing, however, the Contractor shall establish a Plant Mix Formula (PMF) for asphalt content and gradation which meets the above requirements and submit it to the District for approval. The District shall review the design and submit a completed T-400 form to the Materials Control, Soil, and Test Division. The Materials Division will assign a laboratory number to the design. This PMF shall also include the percentage of any additive that may be used as a stiffener for the curbing mix. If lime or other similar granular additive is used, then this material should be included in the PMF gradation. The mix shall be produced within the allowable tolerances of the following table.

Plant Mix Formula	**Plant Mix Tolerance Range**
Percentage Passing Sieve Sizes 3/8 inch (9.5 mm), # 4 (4.75 mm)	± 7 Percentage Points
Percentage Passing Sieve # 8 (2.36 mm)	± 6 Percentage Points
Percentage Passing Sieve Sizes # 16 (1.18 mm), # 30(600µm)	± 5 Percentage Points
Percentage Passing Sieve Size # 50 (300µm)	± 4 Percentage Points
Percentage Passing Sieve Size # 200 (75µm)	± 3 Percentage Points
Percentage of Asphalt	± 0.5 Percentage Points

The Contractor shall perform quality control sampling and testing of the asphalt curbing mix by taking a random sample once per day of production and testing for asphalt content and

gradation to verify the materials composition. If testing indicates that the plant mix formula tolerances are not being met, then production shall halt until the reason for any deficiencies are determined and adjustments are made to correct these deficiencies and documented in the plant diary.

CONSTRUCTION METHODS

610.3-PLAIN CONCRETE CURBING, INTEGRAL CONCRETE CURBING, AND COMBINATION CONCRETE CURB AND GUTTER:

610.3.1-Excavation: Excavation shall be made to the required depth, and the base upon which the curb is to be set shall be compacted to a firm, even surface. All soft and unsuitable material shall be removed and replaced with suitable material which shall be thoroughly compacted. When called for on the Plans, the base upon which the curb is to be set shall be constructed of bed course material in accordance with 609.

610.3.2-Form: Forms shall be of wood or metal, straight, free from warp, and of such construction that there will be no interference with the inspection of grade or alignment. All form shall extend for the entire depth of the curb and shall be braced and secured sufficiently so that no deflection from alignment or grade will occur during the placing of the concrete. Forms shall be cleaned and oiled just prior to placing the concrete.

610.3.3-Mixing, Placing, and Finishing: Concrete shall be proportioned, mixed, and placed in accordance with the requirements for the class of concrete specified. Concrete shall not be transported in nonagitating trucks. Compaction of concrete placed in forms shall be by vibration or other acceptable methods. Drainage openings shall be made through the curb, where indicated, or as directed by the Engineer, at the elevation and of the size required. Forms shall be left in place for 24 hours unless the concrete has set sufficiently prior to that time to permit their removal without injury to the curbing. Upon removal of the forms, the exposed curbing face shall be immediately rubbed to a uniform surface. Rubbing shall be accomplished by the use of water and a wood block or carborundum brick. For the purpose of matching adjacent concrete finishes or for other reasons, the Engineer may permit other methods of finishing. No plastering will be permitted. All damaged and rejected curb shall be removed and replaced.

610.3.4-Sections: All concrete curbing shall be constructed in sections having an approximate length of 10 feet ~~(3 m)~~ unless otherwise indicated on the Plans or directed. In the construction of integral concrete curb or combination concrete curb and gutter abutting concrete pavement, the sections shall be such that the contraction and expansion joints are located opposite the contraction and expansion joints respectively in the pavement. Sections shall be separated by joints 1/8 inch~~.~~ ~~(3mm)~~ wide except at expansion joints. All joints shall be filled with joint sealing material conforming to the requirements of 708.3.

610.3.5-Expansion Joints: Expansion joints shall be formed at the intervals shown on the Plans using a preformed expansion joint filler having a thickness of ¾ inch ~~(19 mm)~~. When the curb is constructed adjacent to or on concrete pavement, expansion joints shall be located opposite or at expansion joint in the pavement.

610.3.6-Curing: Immediately upon completion of the rubbing, the curbing shall be moistened and kept moist for three days, or the curbing shall be cured by the use of membrane forming material. The methods and details of curing will be subject to the approval of the Engineer.

610.3.7-Backfilling: After the concrete has set sufficiently, the spaces in front and back of the curb shall be refilled to the required elevation with suitable materials, which shall be thoroughly tamped in loose layers of not more than 6 inches ~~(150 mm)~~.

610.3.8-Curb Machine: Where a concrete curb or curb and gutter is not required to be constructed integral with or tied to a concrete base and pavement it may be placed with a self-propelled machine consisting of a hopper and having a power driven screw or screws. The proper density and cross section shall be obtained by forcing the concrete through a mold of the specified cross section. Where a track is used, the track on which the machine operates shall be set and held to the line and grade given by the Engineer. The concrete shall be of such consistency that it can be molded into the desired shape and will remain as placed without slumping of the vertical or sloping faces.

The consistency test may be omitted, and the yield determined from the volume required, adjusted for waste.

~~**610.4-REFLECTING CONCRETE CURBING:**~~

~~Construction methods for this item shall conform to the requirements of 610.3 with the following supplements:~~

~~The reflecting surface of the curbing shall be a mortar mix consisting of one part white Portland cement to 1¾ parts of light colored, washed mortar sand. This mortar mix shall have a thickness of approximately 1 inch (25 mm). Alternately, the entire curbing may be constructed of concrete with white Portland cement. When this alternate procedure is used, it shall conform to "Placing of Concrete Curb by Separate Methods" shown on the Plans.~~

~~Washed mortar sand shall meet all the requirements for mortar sand and shall be of a light color satisfactory to the Engineer. The reflecting surface mortar shall be placed immediately after placing of the base concrete. In no case shall more than 20 minutes elapse between the placing of the base concrete and the placing of the reflecting surface.~~

~~Scoring or surface deformation of finish of the reflecting surface shall conform to the details shown on the Plans. Care shall be taken to prevent discoloration during and after construction of the curb, and, if discolored, it shall be adequately cleaned by a method approved by the Engineer.~~

610.4-BLANK

610.5-ASPHALT CURBING:

610.5.1-Equipment & Tools: All equipment, tools, and plant machinery to be used for executing the work prescribed will be subject to the approval of the Engineer.

Asphalt curbing shall be constructed by the use of self-propelled automatic curber or curb machine or a paver with curbing attachments. This automatic curber or machine shall meet the following requirements:

i. The weight of the machine shall be such that required compaction is obtained without the machine riding above the bed of which curbing is constructed.
ii. The machine shall form curbing that is uniform in texture, shape, and density.

610.5.2-Excavation: Excavation, when required, shall conform to the requirements of 610.3.1.

610.5.3-Preparation of Bed: When curbing is to be constructed on a fresh laid asphalt surface, the curb shall be laid only after the surface has been cleaned.

When curbing is to be constructed on a cured or aged Portland cement concrete base, asphalt pavement, or asphalt treated base, the bed shall be thoroughly swept and cleaned by compressed air. The surface shall be thoroughly dried and, immediately prior to placing of the asphalt mixture, shall receive a tack coat of asphalt material. The rate of application of tack coat material shall be between 0.05 to 0.15 gallons per square yard ~~(0.226 to 0.679 liters per square meter)~~ of surface. The Contractor shall prevent the spread of this tack coat to areas outside of the area to be occupied by the curb.

610.5.4-Mixing and Placing: The asphalt mixture specified in 610.2 shall be homogeneously mixed and shall be delivered to the hopper of the curb laying machine at a temperature of not less than 200° F ~~(93° C)~~ nor more than 300° F ~~(150° C)~~. Each hopper load of asphalt plant mix shall be run through the curb laying machine which has been adjusted to form and properly compact the asphalt curb.

The Engineer may permit the construction of curbing by means other than the automatic curber or machine when short sections or sections with short radii are required or for such other reasons as may seem to warrant it. The resulting curbing shall conform in all respects to the curbing produced by the use of the machine.

610.5.5-Joints: Unless conditions warrant, asphalt curb construction at the specified temperature shall be a continuous operation in one direction to eliminate curb joints. However, where conditions are such that this is not possible, the joints between successive days' work shall be carefully made in such a manner as to insure a continuous bond between the old and new sections of the curb. All contact surface of previously constructed curb shall be given a thin, uniform coat of hot asphalt material just prior to placing the fresh asphalt curb material.

610.5.6-Curing: The newly laid curb shall be protected from traffic by barricades or other suitable methods until the heat of the asphalt mixture has dissipated and the mixture has obtained its proper degree of hardness.

610.5.7-Painting Curb: The completed curb shall be painted with a diluted emulsified asphalt paint coat or emulsified asphalt slurry to prevent moisture absorption. The paint coat shall be prepared with a 50-50 blend of water and emulsified asphalt, grade SS-1.

610.5.8-Seasonal Limitations: No asphalt material shall be laid when the temperature of the air is 50° F ~~(10° C)~~ or less, or during other unfavorable weather conditions.

610.6-MEDIAN~~S~~ BARRIER:

Median~~s~~ Barrier shall be constructed in accordance with the Standard Details Book, Volume I, and to the details shown on the Plans. Construction methods shall conform to the applicable requirements in 610.3.

~~**610.7 RESETTING CURB:**~~

~~**610.7.1 Salvage of Curbing:** The Contractor shall carefully remove, store, and clean any curbing specified for resetting. The Contractor shall replace any existing curbing, specified to be reset, which is lost, damaged, or destroyed as a result of their operations or because of their failure to store and protect it in a manner that would eliminate its loss or damage.~~

~~**610.7.2 Excavation:** Excavation and bedding shall conform to the requirements of 610.3.1.~~

~~**610.7.3 Placing Curb:** The curb shall be set on a firm bed with the front top arris line conforming to the required line and grade. All sections of curbing shall be set so that the maximum opening between adjacent sections, for the entire exposed top and face, is not more than 1/4 inch (6 mm), except that the maximum opening at expansion joints shall be not more than ¾ inch (19 mm). Any dressing of the ends of the curbing necessary to meet this requirement shall be done by the Contractor.~~

~~Expansion joints shall be filled with ¾ inch (19 mm) thick expansion joint fillers, which shall be placed concurrently with the curb.~~

~~**610.7.4 Backfilling:** The spaces in front and back of the curb shall be refilled to the required elevation with suitable material. This material shall be placed in loose layers of not more than 6 inches (150 mm) and thoroughly tamped.~~

~~**610.7.5 Cutting and Fitting:** Cutting or fitting shall be done, when necessary, in order to install the curbing at the locations directed.~~

610.7-RAISED CONCRETE TRAFFIC ISLAND:

Raised Concrete Traffic Islands are curb-enclosed areas with standard concrete curbing enclosing an area of raised concrete island cover for the channelization of vehicular traffic and the safety of pedestrian, which shall be constructed at the locations and to the outlines and dimensions shown in the plans.

Construction methods for this item shall conform to the requirements of Section 609. The curb will be paid for separately and shall conform to the requirements of 610.3. The curb and adjacent raised concrete traffic island may be constructed monolithically, with the approval of the Engineer.

610.8-METHOD OF MEASUREMENT:

Curbing will be measured by the linear foot ~~(meter)~~ along the front face of the section at the finished grade elevation. Combination Curb and Gutter will be measured by the linear foot ~~(meter)~~ along the face of the curb. No deduction in length will be made for drainage structures installed in the curbing.

The quantity of Median~~s~~ Barrier to be paid will be measured in linear feet, ~~(meters)~~ complete in place and accepted, on the surface and along the centerline of the median.

Raised Concrete Traffic Island will be measured by square yards. The quantity will be determined by the plan quantity as provided in the proposal unless otherwise directed by the Engineer.

Bed course material will be measured by the cubic yard ~~(meter)~~.

610.9-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 prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

610.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
610001-*	Plain Concrete Curbing, Type "type"	Linear Foot ~~(Meter)~~
610002-*	Integral Concrete Curbing, Type "type"	Linear Foot ~~(Meter)~~
610003-*	Combination Concrete Curb and Gutter, Type "type"	Linear Foot ~~(Meter)~~
~~610004-*~~	~~Reflecting Curbing, Type "type"~~	~~Linear Foot (Meter)~~
610005-*	Asphalt Curb, Type "type"	Linear Foot ~~(Meter)~~
610006-*	Median Barrier, Type "type"	Linear Foot ~~(Meter)~~
~~610007-*~~	~~Resetting Curb, Curb Type "type"~~	~~Linear Foot (Meter)~~
610007-*	"thickness" Raised Concrete Traffic Island	Square Yard
610008-*	Bed Course Material	Cubic Yard ~~(Meter)~~

* Sequence number

"type" Type of concrete curb (I, II, III, or IV) or median barrier (X) per Standard Detail

"thickness" in inches

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 623
PNEUMATICALLY APPLIED MORTAR OR CONCRETE (SHOTCRETE)

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

623.1-DESCRIPTION:

This work shall consist of repair of concrete structures, protection of structural steel, or any other type of work as may be designated on the Plans by applying one or more layers of concrete conveyed through a hose pneumatically projected at a high velocity against a prepared surface in conformity with the dimensions and design shown on the Plans. It shall include removal of all loose, soft, honeycombed, and disintegrated concrete, the preparation of the surface, the furnishing and placing of reinforcing steel including wire fabric, dowels, and any other steel items noted on the Plans, and the mixing and applying of shotcrete as outlined in this sub-section.

623.1.1-Definitions:

Dry-mix shotcrete-Shotcrete in which the mixing water is added to concrete materials at the nozzle.

Nozzleman ~~Operator~~-Craftsman on shotcrete crew who manipulates the nozzle, controls consistency with the dry process, and controls final deposition of the material.

Shotcrete-This is mortar or concrete conveyed through a hose and pneumatically projected at high velocity onto a surface.

Wet-mix shotcrete-Shotcrete in which all the ingredients, including water, are mixed before introduction into the delivery hose; compressed air accelerates to the material flow at the nozzle.

623.2-MATERIALS:

Materials shall meet the requirements specified in the following Sections, Subsections, or Standards and other requirements as noted below:

MATERIAL	SUBSECTION OR STANDARD
Accelerating Admixtures	707.13
Air-Entraining Admixtures	707.1
Coarse Aggregate	703.1, 703.2
Curing Materials	7076.-707.10
Fibers*	ASTM C1116

MATERIAL	SUBSECTION OR STANDARD
Fine Aggregate	702.1
Portland Cement	701.1, 701.3
Supplementary Cementitious Materials**	707.4
Reinforcing Steel	709.1, 709.3, 709.4
Water	715.7
Water Reducing Admixtures	707.3
Water Reducing, Accelerating Admixtures	707.14
Water Reducing, Retarding Admixtures	707.2

* ASTM C-1116, Type II or III. Provide a minimum dosage of 1.5 pounds per cubic yard. Use fibers that are a minimum of 1/2-inch ~~(13 mm)~~ length, monofilament or collated-fibrillated microfibers.

** The use of a supplementary cementitious materials will not be permitted when a blended hydraulic cement is used.

Gradation: The aggregate gradation shall comply with the following requirements.

Sieve Size	Percent By Mass Passing Each Individual Sieve
½ inch (12.5 mm)	100
3/8 inch (9.5 mm)	90-100
No. 4 (4.75 mm)	70-85
No. 8 (2.36 mm)	50-70
No. 16 (1.18 mm)	35-55
No. 30 (600 µm)	20-35
No. 50 (300 µm)	8-20
No. 100 (150 µm)	2-10

CONSTRUCTION METHODS

623.3-QUALIFICATIONS:

~~The Contractor shall maintain necessary equipment and qualified personnel to perform all work, sampling, and testing. The minimum qualifications are listed below:~~

623.3.1-Crew Qualifications:

Contractor: The contractor selected must be an American Shotcrete Association (ASA) Qualified Contractor and must have a current qualification. The contractor will have completed at least five shotcrete projects of similar size, scope, and shotcrete process used (dry or wet-mix). The contractor must provide proper documentation, including full contact information for owner/engineer/construction manager/general contractor who contracted the contractor to perform the shotcrete work, a project description, scope, and outcome of previous 5 structural shotcrete projects.

Superintendent, Project Engineer, or Project Manager: The Project Engineer, Project Manager, or Superintendent will have a minimum of 3 years of relevant experience on

structural shotcrete projects. The contractor must provide proof of the previous shotcrete experience.

Foreman: The foreman will have a proficiency in all positions. The foreman will be required to have at least two years of experience on structural shotcrete projects. The foreman must provide references of the previous shotcrete projects that can be contacted to verify the experience and outcome of these projects. The contractor must provide proof of the foreman's previous shotcrete experience.

Nozzleman: The nozzleman will be required to ~~be~~ have a current ACI ~~certified~~ certification as required by the current ACI Shotcrete Nozzleman certification policy ~~(CCP 660.1)~~ in vertical shooting, and if overhead work is included in the scope of work, then an additional ACI overhead certification will be required. The nozzleman will be required to have a current ACI certification in the shotcrete delivery method that is chosen for the project, either dry-mix process or wet-mix process. The Nozzleman ~~Operator~~ must have at least 300 shooting hours of verified experience as a nozzleman ~~operator~~ on projects with a similar application and scope. The contractor must provide proof of the Nozzleman's previous shotcrete experience. The nozzleman will also be able to demonstrate, by test, an ability to satisfactorily perform the required duties and to apply the shotcrete as required by specifications.

623.3.2-Quality Control Personnel:

Shotcrete Inspector: Every project in which shotcrete is included is required to have an independent Shotcrete Inspector with a current ACI Shotcrete Inspector Certification. The Shotcrete Inspector must have verifiable work experience in one of the following areas: 1. Testing, inspection, and quality control of shotcrete. 2. Supervision of shotcrete construction work. 3. Design of shotcrete structures. The Shotcrete Inspector is required to be at the place of shotcrete placement while shotcrete placement is occurring.

623.4-PROPORTIONING:

Unless otherwise specified, the proportioning and mix design of shotcrete shall conform to Section 601.3. For the mix design using potentially reactive aggregates select the level of prevention of Class B concrete in Table 601.3.1.1.1.3. At least 30 calendar days prior to the start of construction, the Contractor shall design and submit, to the Engineer, for approval, the proportions of materials, including cement, aggregate, admixtures, fibers, and supplementary cementitious materials, to be used which will result in a mixture conducive to effective shotcreting, and a mixture having the desired properties. A mix design shall be required for each different type of shotcrete to be used in the work. The mix design shall be accompanied by a statement giving the source of materials and components used in the mix. All shotcrete mix designs will be accepted based on the results of preconstruction testing.

When using the wet-mix process the air content of the concrete must be ~~10 ± 2%~~ 7 ± 1% before shooting.

Dry-mix shotcrete may be used provided that the in-place air entrainment shall be checked at least once at the beginning of the operation, once in the middle, and once after restarting the shotcrete process after any breaks each day and found that the in-place mixture has a ~~minimum~~ of 4 ± 1%% air entrainment.

The maximum allowable w/c ratio for any shotcrete mix design will be 0.45. Shotcrete shall achieve a minimum compressive strength of 2000 psi in 3-days and 4000 psi in 28-days when tested using cores in accordance with ASTM C1140.

Compressive strength and plastic air content test results from at least one test panel for each mix design shall be submitted to the Engineer prior to construction.

623.5-PRE-CONSTRUCTION TESTING:

Prior to the start of construction, the contractor will shoot ~~two~~ qualifying test panels. At a minimum, two panels will be shot for every different mix design that is going to be used on the project. Additional test panels may be required at the discretion of the Engineer. The same ACI certified nozzleman, crew, and equipment that will be performing shotcreting operations on the project must be used to shoot the test panels. If during construction~~,~~ the nozzleman is changed, the new nozzleman will be required to shoot additional test panels prior to beginning work. The same shooting positions that will be used in the project must be used in shooting the test panels. All form materials and procedures will comply with ASTM C-1140.

One of these two test panels will have reinforcement which is the same as the most congested section on the shotcrete project and shall use the same mix design designated for that section of the project. The finish that is selected for the section of the project, which the panel with reinforcement represents, will be applied to the panel with reinforcement, to indicate whether that finish has any effect on the shotcrete encasement around the reinforcement. This will be used to qualify the nozzleman and shotcreting feasibility. The minimum diameter for the cores taken from the panel with reinforcement will be 3.75-inches ~~(95 mm)~~ and will be the entire thickness of the panel. The panel with reinforcement will be large enough so that actual project conditions can be simulated. The other panel will have no reinforcement and will be used to qualify the properties of the mix design. The size of the panel without reinforcement, for qualifying the mix design, will be such so that cores can be drilled allowing for 3-inches ~~(75 mm)~~ diameter and length of 5.5-inches ~~(140 mm)~~ or the thickness of the panel, whichever is greater. This process shall follow the guidelines of ASTM ~~C 1604~~ C1604. A WVDOH representative and the Shotcrete Inspector must be present when the test panels are constructed and tested, and the WVDOH representative and the Shotcrete Inspector must inspect the performance of the test panels with reinforcement for quality of shotcrete placement, quality of nozzleman, and encasement.

Three cores shall be taken from the test panel with reinforcement and will be visually inspected to ensure proper shotcrete placement and consolidation around the reinforcement. Three cores shall be taken from the test panel without reinforcement and will be tested in accordance with ASTM ~~C 1604~~ C1604. Cores that are damaged from drilling must be immediately discarded.

If any preconstruction testing panel fails the contractor will be allowed to shoot another test panel with the same nozzleman, equipment, and mix design. If the second panel also fails, the contractor must make changes until the shotcrete panel passes the testing. These changes must be implemented during the entire shotcreting process during construction.

If permitted by the Engineer on small projects, where preconstruction testing is cost prohibitive, the requirement for constructing test panels may be waived if the contractor provides results of previous tests with the same nozzleman, materials, mix designs, qualified personnel, and similar project application. The requests must be made to the Engineer and approved before pre-construction testing may be omitted.

A site on the project must be selected by the engineer to perform a tensile bond strength test between the original concrete, which will be repaired, and the new layer of concrete placed with shotcrete. The contractor will repair the selected site and after curing, a minimum of three tests will be performed following the guidelines of ASTM C1583 (Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete

Repair and Overlay Materials by Direct Tension (Pull-off Method)~~, and T~~the minimum bond strength which the average of the three tests shall meet is 150 psi. If the average of the three tests do not meet this bond strength requirement then changes should be made to mix design, or methods to ensure the specified bond strength.

623.6-TESTING DURING CONSTRUCTION:

The Contractor must notify the Engineer at least 48 hours prior to beginning any shotcreting operations.

The Contractor shall perform Quality Control Testing as outlined in this sub-section.

623.6.1-Sampling and Testing Methods:

Sampling Materials for Shotcrete	ASTM C1385
Temperature of Freshly Mixed Hydraulic Cement Concrete	ASTM C1064
Testing of Air Content	ASTM C231 or AASHTO T152
Preparing and Testing Specimens from Shotcrete Test Panels	ASTM C1140
Obtaining and Testing Drilled Cores of Shotcrete	ASTM C1604

623.6.2-Temperature: Testing of the temperature will be performed hourly and shall be within the allowable temperature ranges specified in Section 601.9.

623.6.3-Air Content: For wet-mix shotcrete, the air content must be ~~10 ± 2%~~ 7 ± 1% when tested prior to placement. The testing frequencies of air content for wet-mix shotcrete, prior to placement, will be as required in MP 601.03.50 Table 1 Section C.

~~Dry-mix shotcrete may be used if air entraining admixture is used.~~

A, "as shot shotcrete", air test shall be performed one per ½ day of operation for both wet-mix and dry-mix shotcrete as follows. The shotcrete nozzleman ~~operator~~ will shoot a sample of shotcrete into a wheelbarrow or at the wall or floor, then place the shotcrete sample into the air meter using a scoop. The subsequent sample will follow guidelines of ASTM C231 or AASHTO T152. The ~~minimum~~ air entrainment of the "as shot shotcrete" will be 4.0 ± 1%.

623.6.4-Compressive Strength: During construction, test panels shall be shot for each different mix in the project. The panels will have a minimum dimension of 16 inches x 16 inches ~~(400 mm x 400 mm)~~ and have enough depth to allow cores to be 5.5-inches ~~(140 mm)~~ long. One test panel will be shot for each mix every day or every 50 yd^3 ~~(38 m^3)~~, whichever produces the greatest number of panels. The panels will then be cured using the procedures in ASTM C1140. Three cores with a diameter of 3 inches ~~(75 mm)~~ and a length of 5.5- inches ~~(140 mm)~~ will obtained from each panel and tested for compressive strength following the guidelines of ASTM C1604.

The minimum 28-day average compressive strength for each set of cores from each panel shall be 3,500 psi ~~(24 Mpa)~~ with no single core strength less than 3,000 psi ~~(21 MPa)~~.

When testing in-place concrete that has been placed using shotcrete, cores will be obtained at the location specified by the Engineer and tested as outlined in ASTM C1604.

623.7-EQUIPMENT AND TOOLS:

The Contractor shall maintain a clean, dry, oil-free supply of compressed air sufficient for maintaining adequate nozzle velocity at all times. The equipment shall be capable of delivering the premixed material accurately, uniformly and continuously through the delivery hose. To prevent sagging or sloughing of freshly-applied shotcrete, control must be taken with the application thickness, nozzle technique, air pressure and rate of shotcrete placement. A minimum 600 CFM compressor capable of producing 120 psi air pressure exiting the compressor is required.

The internal diameter of the hose shall be at least three times larger than the largest particle in the mixture. For shotcrete containing steel fiber-reinforcement, the internal hose diameter shall be a minimum of 1.5 times the length of the fiber, and for shotcrete containing synthetic fibers, the internal hose diameter shall be a minimum of the same length as the fiber.

For all dry-mix applications, a water booster pump must be included in the system adding water to the application.

623.8-HANDLING, MEASURING AND BATCHING OF MATERIALS:

The batch aggregate and cement by weight or by volume must be in accordance with the requirements of Section 601 and AASHTO M157 or ASTM C685~~AASHTO M241~~. The mixing equipment must thoroughly blend the materials in sufficient quantity to maintain placing continuity. The batch, delivery and placement of shotcrete must be completed within 90 minutes of mixing. The use of retarding admixtures may extend application time beyond 90 minutes if approved by the Engineer.

Dry-mix shotcrete shall be sufficiently damp prior to shotcreting. Site-batched dry-mix shotcrete typically does not need to be pre-dampened, since the aggregate usually contains sufficient moisture. However, pre-bagged dry-mix shotcrete must be pre-dampened.

623.9-CLEANING:

All surfaces must be free from damaged material. The surfaces must be clean from dirt, oil, or other contaminants that could inhibit the bond of shotcrete. Concrete or masonry surfaces will be chipped prior to the placement of shotcrete to make surfaces even, sawcut surfaces must be roughened.

In concrete repair work, disintegrated concrete shall first be removed with pneumatic or hand tools. The surfaces shall then be thoroughly blasted to remove all dirt and loose materials, special care being taken in concrete repair work to thoroughly clean exposed reinforcing steel. Any unsound concrete, on which shotcrete will be placed, shall be removed. Prior to applying each layer of shotcrete, the concrete surfaces shall be cleaned and washed with water and dried to a saturated surface dry condition with compressed air.

Earth surfaces shall be dug to line and grade. The surface will be dampened prior to the placement of shotcrete. There will be no pools of standing water prior to the shooting of shotcrete.

623.10-PLACING REINFORCING STEEL:

Lap adjacent sheets of reinforcing wire or reinforcing bars and install anchors as directed on the Plans. If possible, the splices should be lapped from front to back.

623.11-PLACING SHOTCRETE:

Shotcrete shall not be placed if the air temperature is 40°F or lower and falling. The contractor may install shotcrete in temperature less than 40°F if they can prove that they can

provide adequate cold weather protection that will not be detrimental to the strength and quality of the concrete, and if it is approved by the Engineer. Shotcrete shall not be installed on frozen surfaces or ground. Shotcrete shall be deposited with a material temperature of not less than 50° F ~~(10° C)~~ or more than 90° F ~~(32° C)~~, and unless otherwise stated, shotcrete temperature requirements will comply with Section 601.9.

During high wind or rain, unless suitable protective covers, enclosures or wind breaks are installed, shotcrete application shall be suspended. Any newly placed shotcrete that has been exposed to rain making the shotcrete unacceptable shall be removed and replaced. A polyethylene film or equivalent shall be used to protect the work from exposure to adverse weather.

When placing shotcrete on an existing concrete surface, the receiving concrete surface must be damp before shotcrete is placed. Care must be taken so that there are no locations of pooled water.

Before an admixture or accelerator, which was not included in the initial mix design qualification, is added to the mix a minimum of two preconstruction test panels must be shot before approval. One test panel must contain the most complicated arrangement of steel which is expected with that mix design, as determined by the Engineer.

Shotcrete may not be placed during precipitation that will disturb the finish or cause the shotcrete to run. Shotcrete will not be placed when wind conditions will disturb the stream of shotcrete before hitting the receiving surface. The Contractor shall maintain the face of the surface on which the shotcrete is to be applied and other surfaces, such as reinforcing steel, clean of loose materials, mud, rebound, overspray or other foreign matter that could prevent or reduce shotcrete bond. Any surface materials that are loosened or damaged~~,~~ should be removed to a sufficient depth ~~should be removed~~. Any material that loosens during application shall be removed. The adjacent surfaces shall be protected from overspray during shooting. Water flow shall be diverted~~,~~ and standing water shall be removed so that shotcrete placement will not be affected.

~~Unless otherwise required, shotcrete will be placed in one layer to eliminate the possibility of cold joints and laminations. If shotcrete is placed in multiple layers, precautions will be taken in order to lessen the chance of cold joints and laminations.~~ The shotcrete shall be applied from the lower part of the area upward to prevent accumulation of rebound. The placement of the nozzle shall be at a distance and approximately perpendicular to the working face so that rebound will be minimal and compaction will be maximized.

Rebound shall not be worked back into the construction. Shotcrete crews must always keep area around nozzleman clean and clear using compressed air to removed impurities and shoveling overspray before that area is shot.

A clearly defined pattern of continuous horizontal or vertical ridges or depressions at the reinforcing elements after they are covered with shotcrete will be considered as indication of insufficient reinforcement cover or poor nozzle techniques. In this case, immediately suspend the application of shotcrete and implement corrective measures. Correct the shotcreting procedure by adjusting the nozzle distance and orientation, ensuring adequate cover over the reinforcement and adjusting the water content of the shotcrete mix or other means.

Any shotcrete surface defects shall be repaired after placement as soon as possible. Any shotcrete that exhibits segregation, honeycombing, lamination, void or sand pockets, or excessive shrinkage cracking shall be removed and replaced. In-place shotcrete not meeting the specified strength requirement will be subject to remediation. Possible remediation options include placement of additional shotcrete thickness or removal and replacement, at no additional cost to the ~~WVDOH~~ Division.

623.12-FINISHING SHOTCRETE SURFACES:

The finish shall be completed as per the contract documents. When specified, a pre-construction mockup panel representing the desired finish shall be provided and evaluated by the ~~WVDOT~~ Division for conformance with the contract documents. When using a troweled or rod finish, the shotcrete must sufficiently set to avoid sagging or sloughing.

623.13-CURING AND PROTECTING SHOTCRETE:

Unless otherwise specified, shotcrete shall be cured as outlined in Section 601.12. Immediately after shotcreting and not to exceed 30 minutes after placement, initial curing is to commence. The surface of the concrete must be continually kept moist using a fogging system. Use equipment that produces a fog spray from atomizing nozzles that will uniformly cover the concrete surface. The minimum rate of fog application shall not be less 10.6 gal./h/yd^2. The number and placement of nozzles shall be dependent on the discretion of the Engineer. The mist must be fine enough as to not disturb the finished surface of shotcrete. Final curing must be done through fogging, sprinkling, or a combination of burlap sacks with sprinkling or plastic-coated synthetic fabric with sprinkling. The burlap sacks and plastic-coated synthetic fabric must be kept continually saturated with water by sprinkling. Set up fogging equipment to allow complete coverage of the area to be cured. The surface of the concrete must be continuously kept wept from the time of placement and the alternation of wetting and drying of the concrete surface will not be allowed. Perform sprinkling for final curing by using either soaker hoses or lawn sprinklers. The surface of the concrete is to not be eroded by running water. All methods of final curing must be performed for a period of 7 calendar days. If no other curing method is available due to project limitations, curing compounds can be used and must be placed in two coats of different orientations of applications one vertical and the other horizontal, to ensure a complete seal. Use of curing compounds is only permitted on the final layer of shotcrete and not between layers of application.

623.14-METHOD OF MEASUREMENT:

The quantity of shotcrete to be paid for will be the number of square yards ~~(meters)~~ complete in place and accepted.

623.15-BASIS OF PAYMENT:

The quantities, determined, as provided above, will be paid for at the contract unit price, and shall constitute full compensation for furnishing and preparing of all materials, including reinforcing steel, all items incorporated into the shotcrete work as shown in the Plans such as anchors and bolts, placing, finishing, testing, and curing shotcrete, and all labor, equipment, tools, supplies, and incidentals necessary to complete the work.

623.16-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
623001-*	Shotcrete	Square Yard ~~(Meter)~~

***** Sequence Number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 636
MAINTAINING TRAFFIC

636.20-TEMPORARY TRAFFIC SIGNAL(S) OR TEMPORARY LIGHTING:

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

636.20-TEMPORARY TRAFFIC SIGNAL~~(S)~~ SYSTEM OR TEMPORARY LIGHTING:

636.20.1-Temporary Traffic Signal System: Temporary traffic signal~~(s)~~ system shall consist of furnishing, installing, maintaining, adjusting, and subsequent removal of various types of traffic signal systems as necessary due to the maintenance of traffic plan. It shall include, but not be limited to, temporary traffic signals and traffic signal interconnections to be installed, and temporary modification to permanent traffic signal(s) in accordance with Section 660 and Subsection 715.42 of the Specifications. As a minimum, the temporary traffic signal(s) shall be equipped with a three-dial fixed time controller. When the temporary traffic signal(s) are no longer needed, they will become the property of the Contractor. The existing signal(s) shall be return to its original condition at the completion of the project or as detailed in the plans to match the traffic pattern for each phase of construction work.

636.20.2-Temporary Lighting: Temporary lighting shall consist of furnishing, installing, maintaining, and subsequent removal of various types of lighting systems as necessary due to the maintenance of traffic plan. It shall include but not be limited to lighting to be installed in accordance with Section 662 of the Specifications. When the temporary lighting is no longer needed, it will become the property of the Contractor.

636.23-METHOD OF MEASUREMENT:

636.23.16-BLANK

DELETE SUBSECTION 636.23.16 AND REPLACE WITH THE FOLLOWING:

636.23.16-Temporary Traffic Signal System: "Temporary Traffic Signal System" shall include the furnishing~~,~~ and installation~~,~~ of complete and operational temporary traffic control signal system. It shall also include adjusting and/or furnishing equipment to the existing traffic

signal(s) components to address different phases of construction work. Payment shall include interconnection, maintaining, relocating, resetting, and removal of all equipment and material necessary to adequately meet the requirements of the Traffic Control Plan and shall be measured as complete units~~s~~ and paid by the month, or fraction thereof, and Lump Sum as appropriate.

636.23.23-Temporary Traffic Signal(s) or Temporary Lighting:

DELETE SUBSECTION 636.23.16 AND REPLACE WITH THE FOLLOWING:

636.23.23-~~Temporary Traffic Signal(s) or~~ Temporary Lighting: ~~"Temporary Traffic Signal(s)" shall include the furnishing, installation, maintaining and subsequent removal of all equipment and material necessary to adequately meet the requirements of the Traffic Control Plan and shall be measured as complete units and paid by the month, or fraction thereof.~~

"Temporary Lighting" shall be on a lump sum basis and shall include the furnishing, installing, maintaining and ~~subsequent~~ removal of all equipment and material necessary to adequately meet the requirements of the Traffic Control Plan.

636.25-PAY ITEMS:

DELETE ITEM 636023 "TEMPORARY TRAFFIC SIGNAL" AND REPLACE WITH THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
636023-001	Temporary Traffic Signal System, Wood Pole Note 1	Lump Sum
636023-002	Temporary Traffic Signal System, ~~"location"~~ ~~Note 1~~ Portable Note 2	Month
636023-003	Temporary Traffic Signal System, Modification to Permanent Traffic Signal	Lump Sum

Note 1 To be used with approval from the Traffic Engineering Division.

~~Note 1:~~ ~~"location" shall be designated as "01", "02", etc. for each different physical location as designated on the plans. Each different, physical location will have only one item for each location and shall include all individual temporary traffic signals required at the location regardless of how many signals are required.~~

Note 2 Temporary Traffic Signal System includes all interconnected temporary traffic signals required to institute the Traffic Control Plan; regardless of how many trailer/signals are required for complete signal system per location. The total unit of months shall be computed as the number of temporary traffic signals x the number of months to be operational on the project.

November 4, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 636
MAINTAINING TRAFFIC

636.20-TEMPORARY TRAFFIC SIGNAL(S) OR TEMPORARY LIGHTING:

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

636.20.1-Temporary Traffic Signal(s): Temporary traffic signal(s) shall consist of furnishing, installing, maintaining, adjusting and subsequent removal of various types of traffic signal systems as necessary due to the maintenance of traffic plan. It shall include, but not be limited to, temporary traffic signals and traffic signal interconnections to be installed, and existing signal(s) to be modified in accordance with Section 660 and Subsection 715.42 of the Specifications. As a minimum, the temporary traffic signal(s) shall be equipped with a three-dial fixed time controller. When the temporary traffic signal(s) are no longer needed, they will become the property of the Contractor. The existing signal(s) shall be insulated back to its original or proposed condition at the completion of each phase of construction work.

636.20.2-Temporary Lighting: Temporary lighting shall consist of furnishing, installing, maintaining, and subsequent removal of various types of lighting systems as necessary due to the maintenance of traffic plan. It shall include but not be limited to lighting to be installed in accordance with Section 662 of the Specifications. When the temporary lighting is no longer needed, it will become the property of the Contractor.

636.23-METHOD OF MEASUREMENT:

636.23.16-BLANK

DELETE SUBSECTION 636.23.16 AND REPLACE WITH THE FOLLOWING:

636.23.16-Temporary Traffic Signal System: "Temporary Traffic Signal System" shall include the furnishing and installation of complete and operational temporary traffic control signal system. It shall also include adjusting and/or furnishing equipment to the existing traffic signal(s) components to address different phases of construction work. Payment shall include interconnection, maintaining, relocating, resetting, and removal of all equipment and material

necessary to adequately meet the requirements of the Traffic Control Plan and shall be measured as complete unit and paid by the month, or fraction thereof, and Lump Sum as appropriate.

636.23.23-Temporary Traffic Signal(s) or Temporary Lighting:

DELETE SUBSECTION 636.23.16 AND REPLACE WITH THE FOLLOWING:

636.23.23-Temporary Lighting: "Temporary Lighting" shall be on a lump sum basis and shall include the furnishing, installing, maintaining and removal of all equipment and material necessary to adequately meet the requirements of the Traffic Control Plan.

636.25-PAY ITEMS:

DELETE ITEM 636023 "TEMPORARY TRAFFIC SIGNAL" AND REPLACE WITH THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
636023-001*	Temporary Traffic Signal System, Wood Pole	Lump Sum
636023-002	Temporary Traffic Signal System, Trailer Note 1	Month
636023-003	Temporary Traffic Signal System, Existing	Lump Sum

Note 1

Temporary Traffic Signal System includes all interconnected temporary traffic signals required to institute the Traffic Control Plan; regardless of how many trailer/signals are required for complete signal system per location.

*-To be used with the approval from the Traffic Engineering Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 659
SIGN LIGHTING

659.2-MATERIALS:

659.2.2-Conduit:

DELETE THE CONTENTS OF SUBSECTION 659.2.2 AND REPLACE WITH THE FOLLOWING:

All conductors shall be run in conduit, except for overhead or temporary installations and where conductors are run inside poles. Conduit to be installed underground, on the surface of poles, or in structures, except as shown on the Plans, shall be Type R, Type F, ~~or~~ Type P, or Type H as follows:

i. Type R (Rigid Steel Conduit) shall meet the requirements of Section 715.42.10.1.

ii. Type F (Flexible, Liquid-Tight Conduit) shall meet the requirements of Section 715.42.10.2.

iii. Type P (Polyvinyl Chloride Conduit) shall meet the requirements of Section 715.42.10.3.

iv. Type H (High Density Polyethylene Conduit) shall meet the requirements of Section 715.42.10.4.

Standard and expansion couplings and other fittings for the Type P conduit shall all be of the same materials as the conduit.

Other fittings for metal conduit shall be threaded malleable iron conforming to the requirements of ASTM A-338 and shall be galvanized in accordance with the requirements of ASTM A-153.

The size of conduit used shall be as shown on the Plans or as specified. If size is not shown on the Plans, the National Electrical Code shall govern as to the necessary conduit size.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 662
ROADWAY LIGHTING

662.2-MATERIALS:

662.2.3-Electric Conduit:

ADD THE FOLLOWING SUBSECTION:

662.2.3.3-Type H (High Density Polyethylene Conduit): Type H (High Density Polyethylene Conduit) shall meet the requirements of Section 715.42.10.4.

662.15-METHOD OF MEASUREMENT:

662.15.1-Conduit:

DELETE THE CONTENTS OF SUBSECTION 622.15.1 AND REPLACE WITH THE FOLLOWING:

Galvanized Steel Conduit, ~~and~~ PVC, and High Density Polyethylene Conduit will be measured as a complete and operable conduit system on a lump sum basis per service.

662.17-PAY ITEMS:

ADD THE FOLLOWING ITEM TO THE TABLE:

Item	Description	Unit
662004-*	High Density Polyethylene Conduit	Lump Sum

* Sequence Number

September 9, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.42-TRAFFIC SIGNAL MATERIALS AND EQUIPMENT:

715.42.10-Electrical Conduit:

ADD THE FOLLOWING SUBSECTION:

715.42.10.4-Type H (High Density Polyethylene Conduit): Type H conduit shall be extruded from virgin HDPE resin tested in accordance with ASTM D3350, NEMA TC 7, and ASTM 2160. Type H Conduit shall meet the following requirements:

a. Stabilized against thermal and UV degradation.
b. Conduit to be of a continuous length, smooth walled with a low friction internal surface containing no welds or joints and coiled on a reel.
c. Dimensions: Schedule 40 for under roadways shoulders, driveways, or sidewalks.
d. Suitable for the following installation methods: Directional Bore.
e. Where 3" HDPE conduit is indicated in the Drawings, the Contractor may elect to use pre-installed cable-in-conduit. Cable type and quantity is indicated on the drawings.
f. Standards: ASTM D2447, ASTM D3350, ASTM D3485, UL 651B, AASHTO R63-13, NEMA TC 7.
g. Colors for conduit applications shall be:
    i. Black with red stripe for electric power lines, cable, and lighting cables
    ii. Orange or black with orange stripe for communication, alarm, or signal lines.

September 9, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 659
SIGN LIGHTING

DELETE THE CONTENTS OF SUBSECTION 659.2.1 AND REPLACE WITH THE FOLLOWING:

659.2-MATERIALS:

~~**659.2.1-Equipment Lists and Drawings:** The Contractor shall submit to the Engineer for approval detailed drawings in duplicate of switch box and luminaire equipment and of any proposed deviations from the Plans. Following checking, correction, and approval, not less than eight complete sets shall be submitted to the Engineer. The Division will not be liable for any material purchased, labor performed, or delay to the work prior to such approval.~~

~~If ordered by the Engineer, the Contractor shall submit for approval sample articles of the materials proposed for use. Parts list, service instructions, and all apparatus warranties packaged with or accompanying the electrical equipment to be installed on the project shall be delivered to the Engineer.~~

659.2.1-Electrical Material Documentation and Certification: All work, equipment, and documentation shall conform to 715.43.

September 8, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 660
TRAFFIC SIGNALS

DELETE THE CONTENTS OF SUBSECTION 660.1 AND 660.2 AND REPLACE WITH THE FOLLOWING:

660.1-DESCRIPTION:

This work shall consist of furnishing and installing various types of traffic signal systems. It shall include, but not be limited to, traffic signals and traffic signal interconnection systems to be installed in accordance with this Specification, as shown on the Plans or as directed by the Engineer.

All electrical work shall conform to current requirements of the *National Electrical Code*, latest edition, all local codes and Section ~~631~~ 715.43 of the Standard Specifications.

All details not specified or not shown on the Plans shall conform to the requirements of the latest issue of the Manual on Uniform Traffic Control Devices, (referred to as the MUTCD). This Manual is published by the Federal Highway Administration of the U.S. Department of Transportation and supplemented by the publication "Official Ruling on Request" and the West Virginia Division of Highways Traffic Engineering Division Directives.

660.2-MATERIALS:

All materials shall be new and shall conform to the requirements of the following subsections of 715.42, Traffic Signals.

MATERIALS	SUBSECTION
Adjustable Face Signal Heads	715.42.6
Auxiliary Traffic Signal Equipment	715.42.7
Cabinets	715.42.8
Conductors	715.42.13
Electrical Conduit	715.42.10
Junction Boxes	715.42.11
Local Coordinating Units	715.42.4
Messenger Cable	715.42.12
Pre-Timed, Fixed Cycle Traffic Signal Controllers	715.42.1

MATERIALS	SUBSECTION
Priority Control System Detector	715.42.7.4
Priority Control System Emitter	715.42.7.4
Signal Supports	715.42.9
Solid State Traffic Actuated Signal Controllers	715.42.2
Supplemental Flashing Beacons & Mountings	715.42.14
Traffic Adjusted Master Controller (Type OPV)	715.42.3
Traffic Detectors	715.42.5

~~Within 15 day following the award of the Contract, the Contractor shall submit to the Engineer a list of equipment and materials which the Contractor proposes to install. The list shall be complete as to the name of manufacturer, size, and identifying number of each item. The list shall be supplemented by such other data as may be required, including detailed scale drawings and wiring diagrams of any special equipment. A signed statement shall accompany the materials list stating that the materials meet the applicable requirements of these Specifications.~~

660.2.1-Electrical Material Documentation and Certification: All work, equipment, and documentation shall conform to 715.43.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 662
ROADWAY LIGHTING

662.2-MATERIALS:

ADD THE FOLLOWING:

662.2.1-Electrical Material Documentation and Certification: All work, equipment, and documentation shall conform to 715.43.

September 14, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.43 THROUGH 715.44-BLANK

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

715.43-ELECTRICAL MATERIAL COMPLIANCE DOCUMENTATION AND CERTIFICATION:

715.43.1-Description: This work shall consist of providing documentation and certification for quality assurance of electrical items furnished and installed including, but not limited to the following items: electric motors, control panels, lighting systems, traffic control systems, wiring, conduits, video monitors, message signs, communications, and other electrical equipment and supplies .

715.43.2-Electrical Equipment Documentation: All electrical equipment shall be from an approved source, approved product list, or be approved by MCS&T before equipment or materials are ordered and installed. The Division will not be liable for any material purchased, labor performed, or delay to the work prior to such approval.

The Contractor shall submit the following items to the Engineer for approval:

a. An itemized Bill of Materials for all electrical equipment. This documentation shall show the rating, make, style, type, manufacturer's catalog number, and National Electrical Manufacturers Association manufacturing standard of each item.
b. A complete wiring diagrams for the work to be done unless appropriate wiring diagrams are shown on the Plans. This wiring diagram shall be submitted prior to installation of conduit and/or electrical equipment.
c. When requested by the Engineer, the Contractor shall submit samples of the materials proposed for use.
d. Parts lists, service instructions, and all apparatus warranties packaged with or accompanying the electrical equipment installed on the project.

All equipment and materials shall be manufactured to National Electrical Manufacturers Association industrial specification grade standards as documented by the manufacturer and meet the requirements of the National Electrical Code (NEC), National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA),

Underwriters' Laboratories, Inc. (UL), Standardization Rules of the Institute of Electrical and Electronic Engineers, Insulated Cable Engineers Association (ICEA, formally known as IPCEA), Electronic Industries Association (EIA), American National Standards Association (ANSI), American Society for Testing Materials (ASTM), The American Wire Gauge (AWG), U.S. Coast Guard Publication, "A Guide to Bridge Lighting," Federal Aviation Administration, “Obstruction Marking and Lighting" AC70/7460-lF, Institute of Electrical and Electronics Engineers (IEEE), American Association of State Highway and Transportation Officials (AASHTO), regulations of local power company, and local, state, and federal codes or ordinances.

715.43.3-Certification of Electrical Equipment: The Contractor shall furnish a Letter of Certification stating that all electrical materials are in conformance with Contract document. Also, the Contractor shall submit to Engineer all electrical documentation in accordance with MP 715.43.00.

715.44-BLANK

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 691
HIGH VELOCITY TEXTURING

691.1-DESCRIPTION:

This work shall include the high velocity blasting of existing concrete and/or asphalt pavement for surface texturing at locations and widths shown on the plans or as directed by the Engineer. The work shall be in accordance with the requirement herein, including cleaning the textured surfaces, and collecting and disposing of all surface materials generated during the texturing process at locations approved by the Engineer.

691.2-CONSTRUCTION:

691.2.1-General: Texture the pavement surfaces in a continuous operation of consecutive passes up to 6 feet in width, parallel to the centerline such that a 12-foot-wide lane is completed with a maximum of 2 passes.

Operate the equipment in such a manner that the textured surface has a uniform surface appearance, with a non-directional texture, and is devoid of machine produced streaks, ruts, or over-lap grooves which will inhibit the free flow of water.

Unless otherwise noted in the plans, conduct operations such that the texturing process does not obliterate or remove pavement striping or markings and without causing damage to the raised pavement markers. The distance from the edge of traffic markings to the texture surfaced shall be a maximum of three (3) inches. Texturing is not required in the longitudinal area between the dashed pavement markings (and the raised pavement markers, if appliable), unless specified in the plans.

Thoroughly clean the textured surface of all loose abrasives, surface materials, dust and other objectionable material using vacuum, electromagnetic or other approved methods. Do not store or transfer surface materials on-site. Remove all loose material from the pavement surface without the use of equipment that would result in debris being swept off adjacent to the roadway. Conduct texturing operations in a manner that effectively minimizes the amount of dust being emitted.

Plan and conduct the operation so it is safe for persons and property adjacent to the work including the traveling public.

Conduct a half mile test section to determine the velocity of the steel abrasive media to require a surface texture to yield the highest skid values without damaging the surface. Stop texturing the surface until the Department evaluates the skid values obtained from the test section.

691.2.2-Equipment: The equipment used shall specifically be designed and built for high production pavement texturing. Use equipment employing the HVIM (High Velocity Impact Method) by hurling steel abrasive media at a high velocity to abrade and texture the surface.

The equipment shall be capable of varying the velocity of the steel abrasive as well as the speed of the machine to produce the desired surface texture such that a 12-foot-wide lane is completed with a maximum of two parallel passes. The equipment shall be equipped with a vacuuming method to recover the abrasive and surface materials without emitting objectionable dust into a minimum 6 cubic yard container in such manner that meets or exceeds all local, State, and Federal air pollution control laws and regulations. Each equipment unit shall have a minimum average production rate of 1200 square yards per hour for concrete pavement and 1800 square yards per hour for asphalt pavement.

The equipment shall direct the velocity of abrasion in a bi-directional fashion, giving uniform abrasion to the surface. When transverse grooves are present, use equipment that directs abrasion at an angle transverse to the grooves to give equal texture to the groove edges.

The equipment shall have on-board controls capable of providing and monitoring uniform velocity and direction, and with self-contained lighting for night operations.

Provide additional equipment to electro-magnetically remove any remaining steel abrasive at the same width and production rate of the texturing equipment if deemed necessary by the Engineer.

Upon request by the Engineer, the Contractor may be required to provide documentation from previous pavement texturing projects demonstrating the ability to meet the requirements of this specification or conduct test sections, at no cost to the Division, to demonstrate that ability, prior to the approval of the use of the equipment within the limits of the project.

691.3-BLANK

691.4-TESTING:

The Contractor will test the textured surface using ASTM E2380 Standard Test Method for Measuring Pavement Texture Drainage Using an Outflow Meter. Perform the testing in the presence of the Engineer with a qualified technician. A minimum of three tests are required per lane mile and during startup operations at random locations determined by the Engineer. The Engineer reserves the right to reduce testing for the subsequent lanes. Each one lane mile section shall have a minimum average test result of 10 seconds or less.

The Division will provide equipment and personnel to perform skid testing on the textured surface immediately after the surface has been textured at a maximum of half mile intervals as deemed by the Engineer. If the skid values are significantly lower than the test section reapply the surface treatment over the area until the values are within four points of the test section.

When surface texturing is required for the placement of a high friction surface treatment or an epoxy treatment overlay on a concrete surface the texturing shall meet a minimum standard surface roughness of CSP 5 developed by the International Concrete Repair Institute.

Any additional surface texturing required to meet friction and surface roughness is at no additional cost to the Division.

691.5-DISPOSAL:

All waste shall become property of the Contractor and shall be legally disposed of, in accordance with local and state regulation. Any cost associated with disposing the waste shall be incidental to the surface texturing.

691.6-METHOD OF MEASUREMENT:

Texturing of pavements will be measured by the square yard of pavement textured and accepted. The quantity of pavement texturing will be determined by multiplying the width specified on the plans by the total length of the finished pavement surface.

691.7-BASIS OF PAYMENT:

The contract price per square yard for surface texturing shall be full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in texturing the existing pavement, removing residue, cleaning the pavement, and testing in accordance with these specifications and as shown on the plans.

691.8-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
691001-001	High Velocity Texturing	Square Yard

August 31, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.14-ELASTOMERIC BEARING PADS:

Bearing pads shall meet the requirements of the AASHTO Standard Specifications for Highway Bridges, except for sampling frequency.

715.14.1-Sampling Frequency for Elastomeric Bearing Pads: The sampling rate shall be one bearing pad per lot, per nominal dimensional size. (A change in nominal dimensional size is any change in the designed length, width or height of the bearing pad.)

ADD THE FOLLOWING SECTION:

715.14.2-Approval for Bearing Pads Without Shims: Any bearing pads that do not include shims or internal stiffeners can be accepted using NTPEP test results and certifications. If a manufacturer of bearing pads without shims does not have NTPEP test results or certifications the bearing pad can be accepted using 715.14.1.

August 19, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 611
PRECAST CONCRETE TRAFFIC DIVIDERS

DELETE THE ENTIRE SECTION (SECTION 611- PRECAST CONCRETE TRAFFIC DIVIDERS).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.20-PRECAST CONCRETE TRAFFIC DIVIDERS:

DELETE SUBSECTION 715.20 AND REPLACE WITH THE FOLLOWING:

715.20-BLANK:

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 612
TUNNEL LINER PLATE PIPE

DELETE THE ENTIRE SECTION (SECTION 612-TUNNEL PLATE PIPE).

August 19, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 621
STEEL GRID FLOORING

DELETE ENTIRE SECTION (SECTION 621-STEEL GRID FLOORING).

August 19, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 622
TIMBER BRIDGE STRUCTURES

DELETE THE ENTIRE SECTION (SECTION 622-TIMBER BRIDGE STRUCTURES)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 632
HORIZONTAL DRAINS

DELETE THE ENTIRE SECTION (SECTION 632-HORIZONTAL DRAINS).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 656
SEEDLING PLANTING

DELETE THE ENTIRE SECTION (SECTION 656-SEEDLING PLANTING).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.34-SEEDLING PLANTS:

DELETE SUBSECTION 715.34 AND REPLACE WITH THE FOLLOWING:

715.34-BLANK:

September 7, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 665
PLUGGING GAS, OIL, AND DRILLED WATER WELLS

DELETE THE ENTIRE SECTION (SECTION 656-PLUGGING GAS, OIL, AND DRILLED WATER WELLS).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 689
METALIZING STEEL

DELETE ENTIRE SECTION (SECTION 689-METALIZING STEEL).

~~August 19, 2021~~ October 6, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING:

SECTION 611
PRECAST CONCRETE TRAFFIC DIVIDERS

611.1-DESCRIPTION:

This work shall consist of furnishing precast white Portland cement concrete traffic dividers of the kind and size specified, and installing such dividers at the locations specified in accordance with the Plans and these Specifications.

611.2-MATERIALS:

Materials shall meet the requirements specified in the following Subsections of Division 700:

MATERIAL	SUBSECTION
Joint Mortar	708.8
Joint Sealer	708.3
~~Precast Concrete Traffic Dividers~~	~~715.20~~

611.2.1-Precast Concrete Traffic Dividers: Shall meet the following requirements:

611.2.1.1-Materials:

611.2.1.1.1-Cement: The cement used shall conform to the requirements of Section 701.1 or 701.3. ~~It shall, in addition, be manufactured to conform to the whiteness of Atlas or Medusa brands of white Portland cement.~~

611.2.1.1.2-Water: Water shall conform to the requirements of Section 715.7.

611.2.1.1.3-Aggregates: Fine aggregate shall be white silica sand conforming to the requirements of Sections 702.1.1, 702.1.2, 702.1.4 and 702.1.5. Coarse aggregate shall be marble, 3/4 in. nominal top size. Fine and coarse aggregates shall meet the soundness requirements in 611.2.1.1.4.

611.2.1.1.4-Acceptance Tests: When tested in accordance with ASTM C 88 using sodium sulphate, the weighted average loss in five cycles shall not exceed five percent. If materials are blended to produce the aggregate, each component of the blend shall meet the soundness requirements specified above.

A sample of concrete made with the materials proposed for use in the item, combined in the proportions specified in 611.2.2, shall be submitted to the Engineer for inspection and approval of color. The sample size shall not be less than a two-inch cube.

Certified test reports from the manufacturer for all materials used in manufacturing the dividers shall be furnished.

611.2.1.2-Proportioning: Concrete shall be proportioned to meet the following requirements:

i. The sand-aggregate ratio shall be in the range of 30 to 45 percent.
ii. The maximum allowable slump shall be 1 in.
iii. The maximum water content shall be five gallons per sack of cement.
iv. The minimum cement factor shall be eight sacks per cubic yard of concrete.
v. The amount of entrained air in the plastic concrete shall be seven plus or minus two percent.

611.2.1.3-Placing and Curing: Concrete shall be placed in forms designed to conform to the lengths, shapes and other details of the traffic divider shown on the Plans. Curing shall be in accordance with the applicable requirements in Section 601.

611.3-CONSTRUCTION METHODS:

When the traffic dividers are to be placed in bituminous concrete, they shall not be placed until the bituminous concrete surface has been completed. The opening remaining between the bituminous concrete and the traffic dividers shall be filled with joint mortar or joint sealer.

When the traffic dividers are to be placed in Portland cement concrete, openings into which the traffic dividers are to be set shall be formed by a method acceptable to the Engineer at the time the Portland cement concrete pavement is being placed. The opening remaining between the Portland cement concrete pavement and the traffic dividers shall be filled with joint mortar or joint sealer.

After the traffic dividers are firmly set in the pavement, the lifting holes shall be filled to within ¾ inch of the surface with dry sand and either sealed with joint mortar or joint sealer.

The Contractor shall keep the traffic dividers free of any material tending to deface or discolor them. Any dividers damaged shall be removed and replaced at the Contractor's expense.

611.4-METHOD OF MEASUREMENT:

The quantity of work done will be measured as the number of traffic dividers furnished and installed in place and accepted.

611.5-BASIS OF PAYMENT:

The quantity, determined as provided above, will be paid for at the contract unit price bid for this item, which price and payment shall constitute full compensation for furnishing, preparing, and installing the traffic dividers and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, materials, equipment, supplies, and incidentals necessary to complete the work.

611.6-PAY ITEM:

ITEM	DESCRIPTION	UNIT
611001-*	Precast Concrete Traffic Dividers	Each

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 612
TUNNEL LINER PLATE PIPE

612.1-DESCRIPTION:

This work shall consist of tunneling, lining and field paving for tunnel liner plate pipe, galvanized and asphalt coated, in accordance with these specifications and in reasonably close conformity with the lines, grades, dimensions and locations shown on the Plan or established by the Engineer.

612.2-MATERIALS:

612.2.1-Liner Plates: Tunnel liner plate pipe shall have the neutral axis diameter specified on the Plans, shall be hot dipped galvanized and shall be double dipped in asphalt cement. The plates shall be of the thickness specified, punched for bolting on both longitudinal and circumferential seams, and shall be so corrugated that they have a moment of inertia of not less than that specified on the Plans. Moment of inertia shall be expressed in inches ~~(mm)~~ to the fourth power per inch ~~(mm)~~ of plate based upon the average for one ring of plates. A minimum of 10 percent of the plates shall be provided with grout plugs for grouting the space between the excavation and the plates. Base material for tunnel liner plates shall conform to the requirements of ASTM A-569. Galvanizing of the plates shall conform to the requirements of AASHTO M-167. Plate design shall be such that complete erection of plates can be accomplished from the inside of the tunnel.

~~Plates shall be fabricated in accordance with the applicable detail drawings on pages 298, 300, and 301 of~~ All details not specified or shown on the Plans shall conform to the details and requirements set forth in "Handbook of Steel Drainage and Highway Construction Products", Latest Edition, published by ~~American Iron and~~ Corrugated Steel Pipe Institute.

612.2.2-Hardware: Bolts and nuts used with lapped seams shall be not less than 5/8 inch ~~(16 mm)~~ in diameter. The bolts shall conform to the specifications of ASTM A-449 for plate thickness equal to or greater than 0.209 inches ~~(5.3 mm)~~ and ASTM A-307 for plate thickness less than 0.209 inches ~~(5.3 mm)~~. The nuts shall conform to ASTM A-563, grade ~~a~~ A for A307

bolts and A563 DH for A449 bolts.

Bolts and nuts used with four flanged plates shall be not less than ½ inch ~~(12 mm)~~ in diameter for plate thicknesses up to and including 0.179 inches ~~(4.5 mm)~~ and not less than 5/8 inch ~~(16 mm)~~ in diameter for plates of greater thickness. The bolts and nuts shall be quick acting coarse thread and shall conform to ASTM A-307, Grade A.

Hardware shall be galvanized or cadmium plated in accordance with ASTM A-153, or ASTM B-766, CI.25 respectively.

612.2.3-~~Bituminous~~ Asphalt Coating: ~~Bituminous~~ Asphalt coating shall conform to the applicable requirements of Section 713.3 of the specifications. The plates shall be fully coated.

612.2.4-Paving: Field paving shall be of Class B Concrete, conforming to the applicable requirements of Section 601.3 of the specifiations.

612.2.5-Grout: Grout shall consist of Portland cement and sand conforming to the requirements of Section 218.2 and 218.3.3 of the specification, except that proportions of cement and sand may be modified to suit conditions encountered in the field.

CONSTRUCTION METHODS

612.3-GENERAL:

The Contractor shall furnish shop drawings showing a typical section of the tunnel, details of the plates, seams, size and length of bolts, and the moment of inertia of the plates in inches ~~(mm)~~ to the fourth power per inch ~~(mm)~~ of width for the ring of plates.

At all times during the construction period the work shall be under the supervision of a superintendent with a proven record of tunneling and the use of tunnel liner plates.

612.4-TUNNELING AND LINING:

Work may begin at either the outlet or inlet end. If necessary to reach the entrance grade, a shaft of minimum 8 feet ~~(2.5 m)~~ width and 12 feet ~~(3.7 m)~~ length shall be dug and the shaft sheeted and shored if necessary. Tunnel mucking shall be carried out not greater than 24 inches ~~(600 mm)~~ ahead of the bolting up of plates. Disposal of the removed spoil shall be in accordance with the directions of the Engineer. Mucking shall be done smoothly to fit the outside of the liner plates. The Contractor shall be responsible for adherence the line and grade, and deviations from line and grade more than 3 inches ~~(75 mm)~~ shall require the approval of the Engineer. If necessary, due to the type of soil encountered, jacking type shield shall be used.

At the end of each working day, the Contractor shall construct a bulkhead inside the pipe at the construction face.

612.5-GROUTING:

Grout blocks shall be installed at each end after bolting up is completed. Grouting shall start at one end and shall be carried forward until the area between the excavation and the plates is completely filled with grout. Grouting should be performed on a daily basis and progressed simultaneously with the installation of the tunnel liner plate.

612.6-FIELD PAVING:

Field paving, using Portland cement concrete, shall be accomplished in accordance with the applicable requirements of Section 604.9 of the specifications.

612.7-METHOD OF MEASUREMENT:

The quantity of work done will be measured in linear feet ~~(meters)~~ of Tunnel Liner Plate Pipe, complete in place and accepted.

612.8-BASIS OF PAYMENT:

The quantity, determined as provided above, will be paid for at the contract unit price bid per linear foot ~~(meter)~~, which price and payment will 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.

612.9-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
612001-*	"size" Tunnel Liner Plate Pipe, 2-Flange Design	Linear Foot ~~(Meter)~~
612002-*	"size" Tunnel Liner Plate Pipe, 4-Flange Design, Type "type", Y	Linear Foot ~~(Meter)~~

* Sequence number

Y = a letter designating base metal (zinc-coated) thickness in accordance with the following table:

Y	MILS (mm)
B	79 (2.0 mm)
C	109 (2.7 mm)
D	138 (3.5 mm)
E	168 (4.3 mm)
F	188 (4.8 mm)
G	218 (5.5 mm)
H	249 (6.3 mm)
J	280 (7.1 mm)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING:

SECTION 621
STEEL GRID FLOORING

621.1-DESCRIPTION:

Steel grid flooring shall be of the open type or concrete filled type as shown on the Plans. The floor shall meet the requirements for the design of steel grid floors of the current issue of AASHTO Standard Specifications for Highway Bridges. Before fabrication or construction is undertaken, the Contractor shall submit complete shop and assembly details to the Engineer for approval, and no work shall be done until written approval of such details has been received.

621.2-MATERIALS:

621.2.1-Steel: All steel except as noted below shall conform to the requirements of ASTM A 36 and shall have a copper content of not less than 0.2 percent. Form strips used in concrete filled grid floors shall conform to the requirements of ASTM A 569.

621.2.2-Concrete: All concrete in filled steel grid floors shall conform to the requirements for Class A Concrete as specified in Section 601.

CONSTRUCTION METHODS

621.3-ARRANGEMENT OF SECTIONS:

All steel shall be straight and true to line and shall be assembled in a workmanlike manner. Where the main elements are transverse to the centerline of roadway, the units generally shall be of such length as to extend over the full width of the roadway for roadways up to 40 feet ~~(12 meters)~~, but in no case shall the units extend over less than four supports. Where joints are

required, the ends of the main elements shall be welded at the joints over their full cross sectional area or otherwise connected to provide full continuity.

Where the main elements are parallel to the centerline of roadway, the sections shall be as long as practicable, but in no case shall the units extend over less than four supports. The ends of the abutting units shall be welded over their full cross sectional area or otherwise connected to provide full continuity in accordance with the design.

621.4-PROVISION OF CAMBER:

Provisions for camber shall be made as follows:

a) Rigid units that will not readily follow the roadway camber or the roadway crown, as the case may be, shall be cambered in the shop.
b) Longitudinal stringers shall be mill cambered or provided with varying thickness bearing bars along their centerlines so that the completed floor, after dead load deflection, shall conform to the camber shown on the Plans.
c) Transverse stringers shall be mill cambered or provided with varying thickness bearing bars along their centerlines so that the completed floor shall conform to the crown shown on the Plans. These stringers shall also be placed normal to the crown of the roadway to provide even bearings for the grid sections.
d) Where bars are used, the design span length of the grid shall be governed by the width of the bar.

621.5-FIELD ASSEMBLY:

Areas of considerable size shall be assembled before the floor is welded to its supports. The main elements shall be made continuous, and sections shall be connected together along their edges by welding of bars or by other methods meeting with the approval of the Engineer.

621.6-CONNECTION TO SUPPORTS:

The floor shall be connected to its steel supports by welding. Provisions shall be made to provide bearing of all sections on the supporting members by shimming or added weldment. The location, length, and size of welds shall be as per the Manufacturer's recommendations or as shown on the Plans.

The ends of all the main steel members of the slab shall be securely fastened together at the sides of the roadway for the full length of the span by means of steel plates or angles welded to the ends of the main elements or by thoroughly encasing the ends with concrete where the main members are parallel to traffic; suitable side trim shall be used connecting the cross members.

621.7-WELDING:

All shop and field welding shall be done in accordance with Section 615.5.7. Surfaces to be welded shall be free from paint, grease, loose scale, rust and other material that will prevent a

proper weld. A thin coating of linseed oil, without pigment, need not be removed. Any clinkers or slag resulting from flame cutting or other causes shall be removed before welding.

621.8-CONCRETE FILLER:

Floor types with bottom flanges not in contact shall be provided with bottom forms of sheet metal to retain the concrete filler without excessive leakage. These strips shall fit tightly on the bottom flanges of the floor members but shall extend a minimum distance on the flanges in order that there shall be adequate bearing area of the slab on the support.

The concrete shall be Class A, mixed, placed, and cured in accordance with the requirements outlined in Section 601. The concrete shall be thoroughly compacted by vibrating the steel grid floor in a manner satisfactory to the Engineer.

621.9-PAINTING:

All painting shall conform to the provisions in Section 688. The paint system shall be specified in the contract documents.

621.10-METHOD OF MEASUREMENT:

Steel grid flooring will be measured by the number of square feet ~~(meters)~~ complete in place, not including Class A concrete. The volume of Class A Concrete will be computed on the basis of a slab equal to the thickness of the steel grid flooring as called for on the Plans, minus the volume of metal in the steel grid flooring. The volume of metal will be determined from the weight of the steel grid flooring as listed by the fabricator. The cost of construction of roadway drains, scuppers, downspouts, etc., where specified, shall be included in the price bid for Class A Concrete. The expansion devices will be included in the item of structural steel.

621.11-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit price bid for the items listed below, which price 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; except that Class A concrete will be paid for under Item 601001-*.

621.12-PAY ITEMS

ITEM	DESCRIPTION	UNIT
621001-*	Steel Grid Flooring, Filled Type	Square Foot ~~(Meter)~~
621002-*	Steel Grid Flooring, Open Type	Square Foot ~~(Meter)~~

* Sequence number

August 19, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

Note: The highlighted references are old and need to be confirmed before use of special provision.

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING:

SECTION 622
TIMBER BRIDGE STRUCTURES

622.1-GENERAL:

622.1.1-This work shall consist of the fabrication and erection or fabrication and delivery of timber bridge structures in accordance with these specifications and in reasonably close conformity with the lines, grades, dimensions and locations shown on the Plans. All work shall be done and all materials shall meet the requirements of this specification and plan notes.

622.1.2-These specifications apply to the following types of timber bridge structures:

Type A: Longitudinal Stress-Laminated Plank Deck. The superstructure is formed by longitudinal vertical sawn lumber laminations which are clamped together on their wide faces by high-strength steel stressing thread bars through holes in the laminations. Stressing pressure is transferred to the timber by bearing plates located along the outer laminations at the edge of the deck and develops sufficient friction between the laminations to cause them to perform structurally as a unit.

Type B: Cellular Structural Glued-Laminated Beams with Longitudinal Stress-Laminated Plank Deck. The superstructure is formed by longitudinal glued-laminated beams which are stress-laminated into two layers of longitudinal vertical sawn lumber laminations. One layer of vertical lumber is at the top surface of the glued-laminated beam and forms the deck. The second layer is at the bottom surface of the beam. The resulting cross-section is a closed cell box beam configuration.

Type C: Structural Glued-Laminated Beams with Longitudinal Stress-Laminated Plank Deck. The superstructure is a Tee cross-section formed by longitudinal glued-laminated beams which are stress-laminated with a layer of vertical sawn lumber to form the deck.

Type D: Structural Glued-Laminated Beams with Transverse Glued-Laminated Deck Panels. The superstructure consists of longitudinal glued-laminated beams with a non-composite transverse glued-laminated deck panels over the beams.

Type E: Structural Glued-Laminated Longitudinal Deck Panels with Transverse Glued-Laminated Stiffener Beams. The superstructure consists of longitudinal glued-laminated deck panels with transverse glued-laminated stiffener beams.

622.2-MATERIALS:

622.2.1-Stress Laminated Plank Deck, Solid Sawn Curbs, Guardrail Posts and Guardrail: All structural lumber used in the bridge construction will be Northern Red Oak except when Structural Glued-Laminated Timber is specified on the Plans.

All lumber and timber shall be graded in accordance with the Standard Grading Rules for Northeastern Lumber, as published by the Northeastern Lumber Manufacturer's Association Incorporated (NELMA), 272 Tuttle Road, P.O. Box 87A, Cumberland Center, Maine 04021, Telephone # (207) 829-6901.

Lumber for stress-laminated plank decks shall be # 3 Grade or better except wane shall meet # 1 Grade, as specified in the above grading standards Section 20.0 for Structural Joists and Planks. Grading may be performed after rough sawing to approximate dimensions, however crook shall meet the grading rules after preservative treatment. Stress-laminated deck lumber shall be sawed, surfaced two sides (S2S), resawed or otherwise processed so that the resulting fit between adjacent planks will meet the applicable Manufacture-Standard as defined by the NELMA grading rules for the faces.

The thickness of planks shall be from 1-½ inches ~~(40 mm)~~ through 2 inches ~~(50 mm)~~ with only one size to be used in a bridge deck. Stress-laminated deck lumber shall contain not less than 12% nor more than 19% moisture (oven dry basis) after preservative treatment and prior to fabrication. Moisture content is to be confirmed in accordance with AWPA A6, using a minimum sample size of 40 cores per lot of deck lumber taken at random throughout the lot. The length of each core sample shall be one-half the thickness of the deck plank.

Timber for guardrail posts and blockouts, curbs, curb blocks, and guardrail when specified on the Plans shall be "# 2 Grade" or better as specified in the above grading standards Section 25.0 for Beams and Stringers. Material may be rough saw cut to the approximate dimensions shown on the Plans so that after conditioning and preservative treatment the actual dimensions are within plus or minus 3/16 inch ~~(5 mm)~~ of plan cross sectional dimensions.

All lumber and timber shall be graded, approved and stamped or tagged by a lumber grader, certified by an agency who has been approved by The Board of Review of the American Lumber Standards Committee.

All dimensions shown on the Plans for structural lumber shall be actual dimensions.

When structural glued-laminated timber members are specified on the Plans they shall meet the requirements of Section 622.2.6.

622.2.2-Timber Substructures: All beams, stringers, posts, timber and lumber for timber substructures shall be "# 2 Grade" or better Northern Red Oak as specified in the above grading standards Section 25.0 for Beams and Stringers, Section 26.0 for Posts and Timbers or Section 20.0 for Structural Joists and Planks as appropriate.

All beams, posts, timber, stringers and lumber shall be graded, approved and stamped or tagged by a lumber grader, certified by an agency who has been approved by The Board of Review of the American Lumber Standards Committee.

All dimensions shown on the Plans for structural beams, stringers, posts, timber and lumber shall be actual dimensions.

When structural glued-laminated timber members are specified on the Plans they shall meet the requirements of Section 622.2.6.

622.2.3-Metal:

622.2.3.1-Steel Products: Structural shapes, plates and bars (except steel thread bars and fabrication bars) shall meet the requirements of AASHTO M 270M Grade 250. Components requiring fabrication will be made in accordance with Section 615 of the Standard Specifications. Where welded fabrication is required, all work shall be in accordance with ANSI/AASHTO/AWS Bridge Welding Code D1.5. Nondestructive testing of welds is not required. All steel products shall be hot-dip galvanized, after fabrication to AASHTO M 111 except where otherwise noted. Properly documented certified mill test reports shall be provided for all above steel products. Certifications for hot-dip galvanizing shall be provided by the galvanizing plant.

622.2.3.2-Thread Bars: Steel thread bars shall be the size shown in the Plans and shall be designed to allow the use of anchor nuts and couplers that thread onto the deformations. Anchor nuts and couplers shall be of a design and material recommended by the thread bar manufacturer to develop the full tensile strength of the bar. Thread bars shall meet the following:

622.2.3.2.1: Steel thread bars shall be manufactured by a suitable process which will produce bars meeting the chemical, mechanical and physical requirements of AASHTO M 275M, Type II. Where 5/8 inch ~~(15 mm)~~ diameter nominal size bars are specified on the Plans, bars may be supplied to the following requirements in lieu of the above.

622.2.3.2.2: Alternate bars for 5/8 inch ~~(15 mm)~~ size shall meet the following Table:

Nominal Diameter (max.)	¾ inch ~~(19 mm)~~
Effective cross sectional area	0.28 square inches ~~(181 mm2)~~ min 0.33 square inches ~~(213 mm2)~~ max.
Height of deformations	0.045 inches ~~(1.14 mm)~~ min. 0.060 inches ~~(1.52 mm)~~ max.
Weight per linear meter	1.15 lbs. ~~(1.71 kg)~~ min. 1.35 lbs. ~~(2.01 kg)~~ max.
Yield strength (min.)	34,000 lbs. ~~(151.2 kN)~~ (0.2% offset or 0.7% extension under load)

Ultimate strength (min.)	40,000 lbs. ~~(177.9 kN)~~
Elongation, min. (20 bar diameters) or Elongation, min. (10 bar diameters)	4.0% 7.0%
Heat analysis: Phosphorus content (max.) Sulfur content (max.)	 0.040% 0.050%

All tension tests to be performed in accordance with AASHTO M 275M.

622.2.3.2.3: Properly documented certified mill test reports will be provided for each heat of steel thread bars. Mill test reports will document compliance with paragraph 622.2.3.2.1 or 622.2.3.2.2 as applicable.

622.2.3.2.4: All thread bars, anchor nuts, couplers and ancillary hardware shall be hot-dip galvanized to AASHTO M 111. Prior to galvanizing, thread bars shall be blast cleaned to Steel Structures Painting Council Surface Preparation Specification Number 6 (Commercial Blast Cleaning). Acid pickling of thread bars will not be permitted. To provide for proper assembly after galvanizing, excess zinc shall be removed by machining using suitable thread taps and dies from the threads of nuts, couplings and thread-bars as necessary. Removal of excess zinc by heating will not be permitted.

622.2.3.3-Timber Fasteners: Dome head drive spikes and washer head drive spikes noted on the Plans shall be Sealtite Dome Head Drive Spikes and Lewis Washer Head Timber Drive Spikes as manufactured by Lewis Bolt and Nut Company, Minneapolis, Minnesota, or as approved by the Engineer. Round head bolts noted on the Plans shall be metric round head square neck bolts (carriage bolts) meeting the requirements of ANSI/ASME Specification B18.5.2.2M. Dome head bolts noted on the Plans shall have a circular dome shaped head and shall meet the requirements of ASTM A-307, except head markings are not required. Hex head bolts shall be hex or heavy hex and shall meet ASTM A-307. 1¼ inches ~~(30 mm)~~ dome head bolts shall have a minimum head diameter of 3 inches ~~(75 mm)~~ and a minimum head height of 9/16 inch ~~(14 mm)~~. Nuts shall be hex or heavy hex meeting AASHTO M 291M or AASHTO M 292M. Round washers shall be Type A, Wide Series meeting the requirements of ASTM F-844. Washers noted on the Plans as "timber washers" shall be oversize in diameter and thickness, manufactured from cast or malleable iron, hot-dip galvanized and of a style and design typically used in heavy timber construction. Fluted steel dowels (spiral dowels) shall be as manufactured by Wadsworth Equipment Company, Akron, Ohio or as approved by the Engineer. All timber fasteners shall be hot-dip galvanized to meet AASHTO M 232M. Mill test reports, certifications or testing of above fasteners is not required. Acceptance will be based on visual inspection at the project site or at the fabricator's plant.

622.2.3.4-Anchor Bolts at Abutments or Piers: Anchor bolts at bridge abutments or piers shall be ¾ inch ~~(20 mm)~~ diameter steel "all thread" rods meeting the requirements of ASTM A-307, hot-dip galvanized to AASHTO M 232M. Bolt length is governed by deck, timber or steel angle thickness and embedment in concrete as noted on the Plans. Nuts and washers shall be as specified in paragraph 622.2.3.3. Mill test reports, certifications or

testing of anchor bolts, nuts or washers is not required. Acceptance will be based on visual inspection at the project site or at the fabricator's plant.

Anchor bolts in concrete are to be installed using ~~Molly "Parabond" Capsule Chemical Anchor System as manufactured by Molly Fastener Group, 504 Mt. Laurel Avenue, Temple, Pennsylvania 19560, Telephone: (215) 929-5674, or~~ Sup-R-Set Capsules Chemical Anchor System as manufactured by Gunnebo Fastening Corp., ~~P.O. Box 1589,~~ at York, PA~~ 17405, Telephone (717) 846-2200~~, or Rawl Chem-Stud #6500 as manufactured by the Rawl Plug Co., Inc., ~~Two F.B. Powers Square,~~ at New Rochelle, NY, ~~10802, Telephone (914) 235-6300,~~ or approved equal. Installation of anchor bolts is to be in accordance with the chemical capsule manufacturer's recommendations. The end of each anchor bolt is to be ground to the configuration recommended by the chemical capsule manufacturer.

Certification or testing of chemical anchor system is not required.

622.2.3.5-Split Rings, Shear Plates and Nails: Split rings shown or noted on the Plans shall be TECO Wedge-Fit Split Rings, Type M-2, as manufactured by TECO, Colliers, West Virginia or approved equal. Shear plates shown or noted on the Plans shall be TECO Shear Plates Type 143-D Galvanized, as manufactured by TECO, Colliers, West Virginia or approved equal. Split rings and shear plates shall be furnished hot-dip galvanized. Mill test reports, certifications or testing of split rings is not required. Acceptance will be based on visual inspection only.

Miscellaneous nails required during fabrication will be sized by the fabricator considering the intended function. Certification or testing is not required.

622.2.3.6-Steel Beam Guardrail: Steel beam guardrail, fasteners and accessories, when specified on the Plans, shall be in accordance with AASHTO M 180, Type II, Class A, unless otherwise noted. All materials shall be supplied by companies which are included on the Division's list of Certified Suppliers of Guardrail and Associated Hardware.

The Contractor will be responsible for drilling additional holes in the rail, if required, to fit the post spacing shown on the Plans.

622.2.3.7-Anchor Bolts For Guardrail and Diaphragm Fasteners: Anchor bolts connecting steel beam guardrail to wood guardrail shall meet AASHTO M 164M with appropriate nuts and washers, all hot-dip galvanized to AASHTO M 232M. Pipe sleeves at guardrail connection are to be DN25 standard galvanized steel pipe, schedule 40, and may be cut to specified length by pipe cutter or saw cut without repair of cut surface.

Lag screws and standard washers for installation of diaphragms between structural glued-laminated beams shall be standard hex head lag screws and standard mild steel washers all hot-dip galvanized to AASHTO M 232M.

Steel rods, threaded both ends, for installation of diaphragms and guard rail post supports to structural glued-laminated beams shall be manufactured from steel rod meeting AASHTO M 270M Grade 250 or AASHTO M 169 Grade 1018 thru 1045. Nuts and timber washers shall meet the requirements of Section 622.2.3.3. All materials shall be hot-dip galvanized to AASHTO M 232M.

Mill test reports, certifications or testing of anchor bolts, nuts, washers, lag screws or pipe sleeves is not required. Acceptance will be based on visual inspection at the project site or at the supplier's plant.

622.2.3.8-Fabrication bars and accessories for modular construction: Fabrication bars shall be nominal ¾ inch ~~(20 mm)~~ O.D. all thread high strength steel bar with the following properties:

Nominal diameter	¾ inch ~~(19 mm)~~
Yield Strength (min.)	34,000 lbs. ~~(151.2 kN)~~ (0.2% offset or 0.7% extension under load)
Ultimate strength (min.)	40,000 lbs. ~~(177.9 kN)~~
Elongation, min (20 bar diameter) or Elongation, min (10 bar diameter)	4.0% 7.0%
Chemical Analysis: Phosphorus content (max.) Sulfur content (max.)	 0.040% 0.050%

Tension tests shall be performed on full size samples in accordance with ASTM A-370. Threads shall be 10 Threads per inch ~~(2.5 mm per thread)~~ Unified Coarse Thread Series as specified in ANSI B1.1 and shall have Class 2A tolerances.

Nuts for use with fabrication bars shall be heavy hex series and shall meet AASHTO M 291M Grade C, D or DH, or shall meet AASHTO M 292M Grade 2 or 2H.

Bearing and anchor plates shall be carbon steel and shall meet AASHTO M 270M Grade 250.

All material supplied under this paragraph is to be plain, uncoated. Hot dip galvanizing is not required.

The Contractor will provide the Engineer with mill test reports or certifications from the material producers which indicate the materials supplied are in conformance with the referenced specifications.

622.2.3.9-Aluminum Deck Bracket: Cast aluminum brackets connecting glulam deck panels to glulam stringers shall be of a design and dimensions as shown on the Plans and shall meet the requirements ASTM B-108 Alloy 356.0 Temper T6. The Contractor shall provide the Engineer with a letter of certification from the foundry producing the castings. Acceptance shall be based on the certification and visual inspection at the fabrication plant or on the project site.

622.2.4-Preservative Treatment: Treatment of all sawn timber and umber shall be in accordance with the American Wood Protection Association (AWPA) Standard U1, UC4B.

To the extent practical, all lumber and timber members shall be fabricated prior to preservative treatment. Items that are field fabricated shall be treated in accordance with AWPA Standard M4.

All surfaces shall be free of excess treatment solutions at the time of delivery to the job site.

622.2.5-Elastomeric Bearing Pads: Elastomeric bearing pads shall be of the size and type shown on the Plans and shall conform to the AASHTO M-251 with a durometer hardness of 60.

622.2.6-Structural Glued-Laminated Timber (Glulam): All Structural Glued-Laminated Timber members shall be visually graded Southern Pine or visually graded Douglas Fir-Larch as shown on the drawings and specified below.

Materials, manufacture and quality control shall be in accordance with American National Standards Institute/American Institute of Timber Construction (ANSI/AITC) Standard A 190.1, Structural Glued-Laminated Timber, and shall provide allowable design values as shown on the Plans. All design values are based on wet condition of service. Adhesives shall meet the requirements of wet-use for wet conditions of service. Appearance of the members shall be industrial grade. Surfaces of members shall be not sealed and members shall not be wrapped. Members shall be marked with a Quality Mark and, in addition, a Certificate of Conformance shall be provided to the Engineer to indicate conformance with ANSI/AITC A 190.1, Structural Glued-Laminated Timber.

All Structural Glued-Laminated Timber members shall be preservative treated in accordance with AITC Standard 109, Standard for Preservative Treatment of Structural Glued-Laminated Timber and AWPA Standard U1, UC4B, Commodity Specification F.

All surfaces shall be free of excess treatment solution at the time of delivery to the job site.

To the extent practical, all Structural Glued-Laminated Timber members shall be fabricated prior to preservative treatment. Items that are field fabricated shall be treated in accordance with AWPA Standard M4.

622.3-QUALITY CONTROL:

622.3.1-Contractor's Responsibility: The Contractor is responsible for control of the product through all manufacturing operations to assure that the completed work is in conformance with these specifications.

As required by paragraphs 622.2.1 and 622.2.2, all lumber and timber shall be graded, approved and stamped or tagged by a certified grader. The Contractor shall schedule, contract and otherwise arrange for the specified grading inspection. Cost of the inspection is to be included as incidental to the work. The Contractor will provide the Engineer suitable reports which document the acceptance of the lumber by the certified grader.

622.3.2-Manufacturers of Structural Glued-Laminated Timber: All manufacturers of Structural Glued-Laminated Timber (Glulam) members shall be a "licensed laminator" by the AITC as required by ANSI/AITC Standard 190.1. A list of AITC licensed laminators can be obtained from the American Institute of Timber Construction, 11818 S.E. Mill Plain Boulevard, Suite 415, Vancouver, Washington 98684, Telephone (206) 254-9132 or (800) 525-1625.

622.3.3-Wood Preserving Plant: The wood preserving plant shall comply in all respects with AWPA Standard M3, Standard Quality Control Procedures for Wood Preserving Plants. The quality control inspector's responsibilities and inspection procedures are to be in accordance with AWPA Standard M3, Standard Quality Control Procedures for Wood Preserving Plants and AWPA Standard M2, Standard for Inspection of Treated Lumber

Products. The quality control inspector shall conduct all inspections and tests and maintain all records and reports required by the above mentioned AWPA Standards and shall provide copies to the Engineer. Upon completion of all treating operations the treater will also supply a Certificate of Compliance as required by paragraph 7.1 of AWPA Standard M3.

622.3.4-Division's Inspection: The Division shall conduct routine inspections of all laminating, manufacturing, sawing, machining, grading and treating operations to assure the Contractor is complying with the specification requirements. Where deficiencies in material or procedures are noted by the Division inspector, the Contractor shall take immediate steps to correct the deficiency. Any materials found defective or deficient will be rejected and shall be replaced with acceptable material at no cost to the Division.

622.4-SHOP AND ERECTION DRAWINGS:

The Contractor shall submit to the Engineer, in the required number of copies, a complete set of shop and erection drawings as required by Section 105.2 of the Standard Specifications. The drawings shall consist of such detail Plans as may be reasonably required for the successful completion of the work. Shop drawings shall include detailed dimensions and arrangement of the stress-laminating system, deck lumber dimensions including joint locations where full length boards are not utilized, full dimensions and bolting layout of the curb and guardrail when specified, and all bearing details. Shop drawings shall also include details of all Structural Glued-Laminated Timber members.

Upon completion of all fabrication operations and shipment of all material to the project site the Contractor shall forward to the Engineer a complete set of as-built shop drawings in reproducible quality (Mylar or equivalent). The set will consist of the latest revisions of each individual shop drawing that has been previously submitted and approved by the Engineer.

All drawings shall be submitted to the Engineer for approval a minimum of two (2) weeks prior to the start of fabrication. All dimensions shall be in metric units only.

CONSTRUCTION METHODS

622.5-CONSTRUCTION METHODS:

Stress-laminated and structural glued-laminated timber bridges are to be fabricated and erected in accordance with the Plans and these specifications.

622.5.1-Handling: Treated timber shall be carefully handled without sudden dropping, breaking of outer fibers, bruising, or penetrating the surface with tools. Treated members shall be handled with web slings. Cant hooks, peaveys, pikes, cables, chains or hooks shall not be used. When metal bands are used to bundle members, corner protectors shall be provided to prevent damage. Structural glued-laminated beams shall be tipped and lifted on edge using web slings at as many points as necessary to prevent damage. Steel spreader beams shall be utilized to prevent eccentric loading of long members. Glulam plank deck panels may be lifted flat using fabricated steel C-shaped brackets that fit over the member ends. The contractor has complete responsibility for utilizing proper shipping and handling techniques. Any damage shall be repaired or replaced to the satisfaction of the Engineer at no additional cost.

622.5.2-Stress-Laminated Deck Assembly: Stress-laminated decks may be prefabricated at a manufacturing or fabrication facility. The full width or sections of the deck may be prefabricated and stressed, or panels may be fabricated, joined and stressed in the field.

If decks are fabricated in sections and stressed using bearing plates under the thread bar coupler, the bearing plates must be removed after all sections have been joined.

Butt joints are permitted in the lamination provided: a) Lamination length is not less than 4 ft ~~(1200 mm)~~; b) No butt joints are located within a distance equal to the deck thickness from a stressing bar, and; c) No more than one butt joint occurs in any five adjacent laminations within a distance of 2 ft ~~(600 mm)~~. The joint layout is to be shown on the shop drawings.

Gaps between butt ends of deck boards shall be 1 inch ~~(25 mm)~~ or less. The height differential between adjacent deck boards shall be ¾ inch ~~(20 mm)~~ or less.

Holes for stressing bars shall be large enough to allow a bar with a coupler, if used, to be removed from the stressed deck, but shall not exceed 20% of the width of the board, but may be 1¾ inch ~~(45 mm)~~ maximum on a 7 inches ~~(175 mm)~~ board.

Holes into the deck for attaching the deck to the substructure and for attaching curbs and posts to the deck shall not be drilled until after Stage 2 of the stressing procedure is completed. Holes in the substructure shall not be drilled until the deck is in place and after Stage 2 of the stressing procedure is completed.

622.5.3-Stressing: Stressing bars shall be tensioned with a hydraulic jack. The jack shall be calibrated at least yearly to provide an accurate indication of load.

Stressing bars shall be tensioned to the specified load shown on the Plans. Stressing shall be done in accordance with the following procedure:

Stage 1: Load each bar to 50 percent of the specified load using a bar stressing sequence which will prevent distortion and maintain a uniform bridge (panel) width for the full length of the bridge. Repeat using the full specified load until all bars are properly tensioned.

Stage 2: A minimum of five (5) calendar days but not more than seven (7) calendar days after the completion of Stage 1, reload all bars to the specified load.

Stage 3: A minimum of four (4) but not more than six (6) weeks after the completion of Stage 2, reload all bars to the specified loads shown on the Plans.

During the stressing procedure, the load in the first bars that were stressed will most likely decrease as the other bars are stressed. In all three (3) stages, after the Contractor is satisfied that all bars are stressed to the proper load, Contractor shall return to the first three (3) full width bars that were stressed and verify on the hydraulic stress gauge that all three (3) maintained a minimum of 90% of the specified load. If any of the first three (3) full width bars did not maintain at least 90% of the specified load, all the bars on the bridge shall be stressed again. The checking of the first three (3) full width bars and subsequent stressing of all bars shall be repeated until they maintain at least 90% of the specified load.

The Engineer shall be notified at least two (2) working days prior to beginning each stressing stage.

No vehicles shall be allowed on the bridge until the completion of Stage 2 stressing.

622.5.4-Camber: An upward curve or camber shall be provided in each bridge as noted on the Plans. The camber shall be a uniform curve in the length of the bridge and shall show maximum offset at the approximate center of the span. Camber shall be consistent across the bridge width and measurement shall be made at both edges and the centerline.

622.5.4.1-Type A Bridges: When the full bridge width, or sections, are prefabricated and stressed at the fabrication facility, the fabricator shall introduce sufficient initial camber, prior to stressing, so that under full dead load the final camber will be as specified. When panels or individual members are delivered loose, they shall be erected over a temporary support to induce the required camber across the full width of the bridge and shall be adjustable so that it can be lowered to allow full dead load on the bridge, or can be raised to induce additional camber should it become necessary.

If 75% of the final camber is not provided under full dead load the Contractor shall support the structure on a temporary support, loosen all stressing bars, induce additional camber by raising the support, re-stress all bars and lower support to verify proper camber.

622.5.4.2-Type B, C, D and E Bridges: Structural Glued-Laminated Timber members shall be manufactured with the camber shown on the Plans. The camber specified is with no load on the member.

622.5.5-Modular Construction: When specified on the Plans the bridge will be fabricated and erected using modular techniques as described below. The applicable provisions of 622.5.1 through 622.5.4 also apply to modular fabrication and erection.

Modular construction does not apply to Type D and E bridges.

622.5.5.1-Module Assembly: Each module shall consist of the appropriate number of rows of individual deck planks so when mated to the exterior glued-laminated beams the total module width will be as noted on the Plans after the third stressing. The Contractor is responsible for including as many additional rows of deck planks as may be necessary to compensate for lumber compression or shrinkage thru all three stages of stressing.

The deck planks shall be assembled with the two module beams using jigs, pipe guides and nails or other means so that proper alignment and beam camber can be maintained prior to inserting stressing bars. After the two beams and rows of deck planks are properly assembled, steel thread bars meeting the requirements of 622.2.3.2, except the bars need not be coated, shall be inserted in all 2 ft ~~(600 mm)~~ center holes. Stage 1 stressing shall be performed before each module is moved from the assembly jig or the module is handled in any manner. Handling of modules is to be in accordance with 622.5.5.4. In addition, high strength steel fabrication bars meeting the requirements of 622.2.3.8 shall be inserted in all 6 ft ~~(1800 mm)~~ center holes. The 2 ft ~~(600 mm)~~ center bars can be removed before shipping from the fabrication shop and must be removed before the modules are erected on the project site. The fabrication bars on 6 ft ~~(1800 mm)~~ centers will remain permanently in the bridge, except for the exterior (fascia) modules where the bars shall be removed after completion of the field stressing operation. Galvanized bearing plates shall be used on the outside of the fascia modules for all 2 ft ~~(600 mm)~~ center bars. All other bearing plates may be uncoated.

The Contractor is responsible for maintaining the squareness of each module. This may require additional diaphragms, stressing rods, braces, etc. either temporary or permanent. All materials required for this purpose shall be clearly shown on the shop drawings and shall be noted as either temporary or permanent. Materials noted as permanent shall meet all quality requirements of this specification. Attachment of temporary materials shall be such that the preservative envelope of the bridge members is not damaged in any way. Holes in structural glued-laminated members shall be bored prior to preservative treatment and temporary holes shall be filled with treated wood plugs to the satisfaction of the Engineer. Regardless of the method chosen by the Contractor to control module squareness, each completed and fully stressed module at any cross-section throughout its length shall not be out-of-square by more than 1/8 inch ~~(1 mm)~~ per ft ~~(100 mm)~~ of web depth when measured at the top or bottom outer surface of either module web. No more than 0.01 inch ~~(1 mm)~~ of sweep, measured at the module centerline, is allowed per ft ~~(1000 mm)~~ of length. When fully assembled, no more than 0.03 inch ~~(3 mm)~~ of sweep, measured at the bridge centerline is allowed per ft ~~(1000 mm)~~ of length. When fully assembled the bridge width shall be at least as wide as the plan dimension but not more than 1½ inches ~~(40 mm)~~ wider than the plan dimension at any point. No separate payment will be made for these additional materials or labor used to control module squareness. Cost to be included in the unit price for the fabricated bridge members.

622.5.5.2-Shop Module Stressing: All steel thread bars in the 2 ft ~~(600 mm)~~ center holes shall be stressed to the load shown on the Plans. All three stages of stressing shall be performed in the fabrication shop. Upon completion of each stage of stressing, the hex nuts on the fabrication bars on 6 ft ~~(1800 mm)~~ centers shall be fully tightened using the full effort of a man on an ordinary spud wrench.

622.5.5.3-Curbs, Guardrail Posts and Diaphragms: Curbs and guardrail posts for Type A bridges shall be shop installed after the second stressing and at any phase for Type B or C. Diaphragms shall be shop installed after the third stressing. Diaphragms and end blocks shall be fabricated such that a maximum gap of 3/16 inch ~~(5 mm)~~ exists between each side of the diaphragm or end block and the webs of the beams. Some trimming to length of the diaphragms may be necessary to compensate for the loss of module width due to stressing. See 622.2.6 for treating requirements after trimming to length.

622.5.5.4-Handling, Shipping and Erection: As each module is assembled in the fabrication shop, a handling and erection lifting ring system shall be installed after the Stage 1 stressing. Details of the lifting ring system are shown on the Plans. All handling of the modules shall be performed using the lifting rings. Use of forklifts under the modules, slings, choker cables, grab hooks, etc. is prohibited.

Two (2) calendar days after the Stage 3 stressing is completed, the bars on 2 ft ~~(600 mm)~~ centers (not the bars on 6 ft ~~(1800 mm)~~ centers) can be removed, or, all the bars can remain in for shipping. If the Contractor elects to leave all bars in place for shipping, the bars on 2 ft ~~(600 mm)~~ centers must be removed prior to erection. After the Stage 3 stressing and prior to erection, the fabrication bars on 6 ft ~~(1800 mm)~~ centers shall be saw cut off flush with the face of the hex nut, except for the bars on the fascia side of the exterior module which can remain long to facilitate removal of the fabrication bars after erection.

The first module should be positioned on the abutments as precise as possible and secured to the bridge seat. Careful alignment of the remaining modules will facilitate installation of the full width stressing rods.

The modules shall be stressed together after inserting stressing rods and placement of bearing plates. Only one stressing operation is required in the field, although several passes over all the bars may be required to meet the 90% load requirement of 622.5.3.

Upon completion of erection, the fabrication bars in the fascia modules shall be removed and the holes plugged with a treated wood plug.

The handling and erection lifting ring system components shall be removed and will remain the property of the Contractor. Cost of the lifting ring system is considered incidental to Item 622020-*, Stressing Hardware. Holes in the stressed deck shall be plugged with treated wood plugs.

Field nailing to any treated bridge component is prohibited.

622.5.6-Backwall Installation: Backwalls shown on the Plans shall not be placed until after completion of erection of all superstructure components. The end of the bridge members may be used as a form for placement of concrete backwalls provided the preformed joint filler is suitably secured to the bridge. The end diaphragms may require additional bracing or blocking to prevent damage from use as a concrete form. The Contractor is responsible to provide the necessary additional support and will repair any damage to the satisfaction of the Engineer.

622.6-METHOD OF MEASUREMENT:

622.6.1-Stress-Laminated Timber Bridge Fabricated and Installed: The quantity of work done will be measured in 1,000 ft board measure (Mfbm) ~~(cubic meter (m^3))~~ which is based on actual plan sizes of all lumber and timber including structural glued-laminated timber shown on the Plans, and shall include bearings and bearing pads if specified, preformed joint sealer, hot-poured joint sealer, timber connectors and all necessary hardware, except stressing hardware and steel beam guardrail, complete in place and accepted in the finished structure for the structure type noted on the Plans.

Stressing hardware will be measured as a separate item.

Steel beam guardrail and hardware will be measured as Section 607 Items.

622.6.2-Stress-Laminated Timber Bridge Fabricated and Delivered: The quantity of work done will be measured in 1,000 ft board measure (Mfbm) ~~(cubic meter (m^3))~~ which is based on actual plan sizes of all lumber and timber including structural glued-laminated timber shown on the Plans, and shall include bearings and bearing pads if specified, timber connectors and all necessary hardware, except stressing hardware and steel beam guardrail, and delivered in the manner and to the site set forth in the contract documents for the structure type noted on the Plans.

Note: Stressing hardware will be measured as a separate item.

622.6.3-Structural Glued-Laminated Timber Bridge Fabricated and Installed: The quantity of work done will be measured in 1,000 ft board measure (Mfbm) ~~(cubic meter (m^3))~~ which is based on actual plan sizes of all structural glued-laminated members and other timber components as shown on the Plans, and shall include bearings and bearing pads if specified,

preformed joint sealer, hot-poured joint sealer, timber connectors and all necessary hardware, except steel beam guardrail, complete in place and accepted in the finished structure for the structure Type noted on the Plans.

Steel beam guardrail and hardware will be measured as section 607 Items.

622.6.4-Structural Glued-Laminated Timber Bridge Fabricated and Delivered: The quantity of work done will be measured in 1,000 ft board measure (Mfbm)~~(cubic meter (m^3))~~ which is based on actual plan sizes of all structural glued-laminated members and other timber components as shown on the plans, and shall include bearings and bearing pads if specified, timber connectors and all necessary hardware, except steel beam guardrail, and delivered in the manner and to the site set forth in the contract documents for the structure Type noted on the Plans.

622.6.5-Timber Substructure: The quantity of work done will be measured in 1,000 ft board measure (Mfbm)~~(cubic meter (m^3))~~, computed on the basis of actual plan sizes of all lumber and timber members shown on the Plans, and shall include all necessary hardware complete in place and accepted in the finished structure.

622.6.6-Stressing Hardware: The quantity of work for "Stressing Hardware" will be measured and paid for as lump sum. Stressing hardware includes stressing bars, plates, nuts, handling and erection lifting ring system components and any other hardware related to the stressing of the timber.

For 622.6.1 "Stressing Hardware" shall include the initial stressing and restressing at five (5) calendar days and four (4) weeks.

For 622.6.2 "Stressing Hardware" shall include all material delivered in the manner and to the site set forth in the contract documents. When modular construction is specified, "Stressing Hardware" shall also include the initial stressing and restressing at five (5) calendar days and four (4) weeks.

622.7-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, except as above noted, and doing all the work herein prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

622.8-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
622005-*	Stressed Timber Bridge, Type A, Fabricated and Installed	Thousand Board Feet ~~(Cubic Meter)~~
622006-*	Stressed Timber Bridge, Type A, Fabricated and Delivered	Thousand Board Feet ~~(Cubic Meter)~~
622007-*	Stressed Timber Bridge, Type B, Fabricated and Installed	-Thousand Board Feet ~~(Cubic Meter)~~

ITEM	DESCRIPTION	UNIT
622008-*	Stressed Timber Bridge, Type B, Fabricated and Delivered	Thousand Board Feet ~~(Cubic Meter)~~
622009-*	Stressed Timber Bridge, Type C, Fabricated and Installed	Thousand Board Feet ~~(Cubic Meter)~~
622010-*	Stressed Timber Deck, Type C, Fabricated and Delivered	Thousand Board Feet ~~(Cubic Meter)~~
622011-*	Structural Glue-Laminated Timber Bridge, Type D	Thousand Board Feet ~~(Cubic Meter)~~
622012-*	Structural Glue-Laminated Timber Bridge, Type D, Fabricated And Delivered	Thousand Board Feet ~~(Cubic Meter)~~
622013-*	Structural Glue-Laminated Timber Bridge, Type E,	Thousand Board Feet ~~(Cubic Meter)~~
622014-*	Structural Glue-Laminated Timber Bridge, Type E	Thousand Board Feet ~~(Cubic Meter)~~
622019-*	Timber Substructure	Thousand Board Feet ~~(Cubic Meter)~~
622020-*	Stressing Hardware	Lump Sum

* Sequence number

September 7, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

FOR

SECTION 632
HORIZONTAL DRAINS

632.1-DESCRIPTION:

This work shall consist of furnishing and installing plastic horizontal drains and associated plastic outlet pipes, in borings drilled into the faces of cuts, fills, and retaining walls. The installation shall be at locations and at angles as shown on the Plans or directed by the Engineer during construction and shall be in accordance with these Specifications. This work shall also consist of constructing terminal chambers, or collector pipes, when required, in accordance with these Specifications.

632.2-MATERIALS:

632.2.1-Horizontal Drains: Horizontal drains shall be constructed of slotted and solid plastic pipe. The pipe shall consist of nominal 1½ inch I.D. Schedule 80, Type II PVC 2110 pipe conforming to the requirements of ASTM Designation D-l785.

The pipe shall have three rows of slots cut circumferentially in the pipe on the third points (120 degrees apart). The average configuration shall be from 22 slots, plus or minus one slot, per row per foot ~~(300 mm)~~ using 0.050 inch ~~(1 mm)~~ slots, to 46 slots plus or minus one slot, per row per foot ~~(300 mm)~~, using 0.010 inch ~~(250 µm)~~ slots. The number and width of slots will be as specified on the Plans or as approved by the Engineer depending upon the type of soil or rock. Perforated pipe shall not be used.

Solvent cement shall meet the requirements of ASTM D-2564.

632.2.2-Terminal Chamber: Horizontal drain terminal chambers shall be constructed of 48 inch (0.109" Th.) ~~(1200 mm (2.7 mm))~~ metallic coated corrugated steel pipe meeting the requirements of 713.2.

Concrete used for the chamber foundation and incidentals shall meet the requirements of 715.12.

Pipe used to drain the chambers shall meet the requirements of Section 714.22 of the specifications.

632.2.3-Collector Pipes: Collector pipes, if any, shall be nominal 1½ inch unslotted or unperforated PVC pipe meeting the requirements of Section 714.22 of the specifications.

Fittings for collector pipes shall be rigid PVC, Type II, high impact fittings and shall be the solvent weld type. The fittings shall have a bursting pressure equal to or exceeding that of the pipe.

632.3-GENERAL:

The Contractor shall provide a method to determine the end elevations of all plastic horizontal drains. It shall be the Contractor's responsibility to control the drain elevations to avoid all utilities and drainage structures existing at the site.

632.4-DRILLING:

The holes shall be drilled with approved rotary equipment capable of drilling three to six inch ~~(75 to 150 mm)~~ diameter holes through soil or rock formations or retaining walls to the lengths and angles designated on the Plans.

Steel drill casing with an expendable bit having a "J" slot adaptor on the first section, or an equivalent substitute, shall be used for drilling the hole.

632.5-INSTALLATION OF HORIZONTAL DRAIN PIPE:

Prior to removing the casing, the slotted and solid section of the horizontal drain pipe shall be inserted. The end of the first section of the horizontal drain pipe inserted into each hole shall be plugged with an approved stopper. Each successive length of pipe shall be cemented to the previous section.

The last 10 feet ~~(3 meters)~~ of horizontal drain pipe, nearest the slope or wall face, shall be unslotted pipe.

Each drain shall be identified with a two inch by two inch ~~(50 by 50 mm)~~ or two inch ~~(50 mm)~~ diameter copper tag with the identification number stamped on the tag. The tag shall be permanently attached to the outlet end of the drain.

After all the horizontal drains are installed, bentonite pellets shall be thoroughly tamped or packed in the annuli to eliminate all voids between the drill hole and the plastic pipe. The Contractor shall pack the bentonite a minimum of 3 feet ~~(900 mm)~~ into each annulus as measured from the surface. To verify this measurement a bulkhead must be fashioned around the pipe at a distance of three 3 feet ~~(900 mm)~~ from the surface. The bulkhead may consist of rope or other similar material i.e., oakum.

632.6-TERMINAL CHAMBER INSTALLATION:

After the horizontal drains have been installed, the terminal chamber shall be constructed of metallic coated corrugated pipe meeting the requirements of Section 713.2 of the specifications, and placed at the locations and elevations shown on the Plans.

The metal portion of the chamber may be fabricated at the site or in the shop.

After the chamber is in place and the concrete has cured, the area around the chamber shall be backfilled, site graded to drain, seeded, and mulched, as directed by the Engineer. Before the backfill is placed around the horizontal drains and the chamber, the Contractor shall ensure the

bentonite placed between the circumference of the drill holes and the drains is still properly placed. When directed by the Engineer, the Contractor shall place and compact more bentonite.

All bare metal and welded areas shall be thoroughly cleaned and painted with one coat of zinc rich paint meeting the requirements of Section 711.21 of the specifications.

The horizontal drains, installed at each horizontal drain terminal chamber in location, shall be left in a condition that will ensure proper connections can be made to the finished chamber and that the water will be drained into and away from the chamber construction area.

632.7-COLLECTOR PIPE INSTALLATION:

After the horizontal drains have been installed, the collector pipes shall be attached to the horizontal drains as shown on the Plans.

When a collector pipe system is required, the outlet ends of all horizontal drains shall be connected to the collector pipe by means of approved fittings; i.e., tees, plugs, street ells, etc.

632.8-METHOD OF MEASUREMENT:

The quantity of work done for "Horizontal Drains" will be measured in linear feet ~~3 (meters)~~ of pipe, which measurement will include the actual length of drain pipe, and outlet pipe, complete in place and accepted. The installation shall include the drilling, fittings, and bentonite.

The quantity of work performed in installing the horizontal drain terminal chamber and the furnishing of all materials necessary to complete the installation will be measured per each terminal chamber in place and accepted.

The quantity of work performed in installing the collector pipes will be measured per each for collector pipes, which will include the total length of all collector pipes and fittings; i.e., tees, plugs, street ells, etc., for each installation complete in place and accepted.

632.9-BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the Contract unit bid price for the items below, which price and payment will be full compensation for drilling, site grading, seeding, and furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all tools, equipment, supplies, labor and incidentals necessary to complete the work.

632.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
632001-*	Horizontal Drain	Linear Foot ~~(Meter)~~
632002-*	Horizontal Drain Terminal Chamber	Each
632003-*	Horizontal Drain Collector Pipe	Each

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 656
SEEDLING PLANTING

656.1-DESCRIPTION:

This work shall consist of furnishing and planting seedlings of the species called for on the Plans and in the manner prescribed or as directed by the Engineer.

656.2-MATERIALS:

656.2.1-Topsoil: Topsoil shall conform to the applicable requirements of Section 651 of the specifications.

656.2.2-Water: Water shall conform to the requirements in Section 652.2 of the specifications.

656.2.3-Ground Agricultural Limestone: Ground agriculture limestone shall conform to the requirements in Section 715.25 of the specifications.

656.2.4-Fertilizer: Fertilizer for landscape plantings shall conform to the applicable requirements in Section 715.26 of the specifications.

656.2.5-Seedling Plants: ~~Seedling plants shall conform to the requirements specified in 715.34.~~ This material shall have a healthy, well-formed root system, free from disease. All transported stock is subject to inspection by the State Agriculture Department for insect or plant pests, and subject to rejection if found lacking in any of the above requirements.

All plants shall be nursery grown, two years or older, and of the quality and size designated on the Plans, subject to approval both at the nursery and on the planning site. All seedling plants shall meet the requirements of U.S.A. Standard for Nursery Stock, AAN. The 1969 edition shall govern unless a more recent issue is in effect at the time of advertisement of bids.

For seedling plants, a listing of standard names in effect on any date is on file with the Division and is available on request.

The seedling plants shall be true to the type and size indicated on the Plans.

CONSTRUCTION METHODS

656.3-PLANTING SEEDLING PLANTS:

The method of planting seedling plants will be determined to a great extent by the site conditions, namely soil, slope, and type of cover. On areas covered with grass or weed mass, the equivalent of about one square foot ~~(300 square mm)~~ area shall be cleared, including roots. The cleared material shall be placed on the lower side of the plant hole to help retain moisture runoff. A hole large enough for the plant roots shall then be dug, and the plant placed and backfilled with one pint backfill mix and completed with excavated material. The soil then shall be packed around the roots with the foot or heel.

Plant backfill mixture for seedlings shall be three parts topsoil to one part peat moss, with 100 lbs. of fertilizer adder per cubic yard ~~(60 kg of fertilizer adder per cubic meter)~~ of backfill. Any other additives will be shown on the Plans. In loose shale or sand without sod cover, selection of plant location shall be where the soil is stable and not subject to rapid accumulation or erosion. On steep banks a slit shall be opened large enough to receive the plant roots and the replaced soil shall be tamped with the heel.

Seedling plants shall be individually mulched and watered during the planting operations as directed by the Engineer.

The Contractor shall furnish material and mark the location of all seedling plants for future reference. A row shall be identified by a stake at each end and a bed or mass identified by stakes around the perimeter. Wire stake flags will be accepted as markers.

656.4-REPLACEMENT OF SEEDLING PLANTS:

At the discretion of the Engineer, or in the event that it is determined that the survival is not satisfactory, replacement may be required. Only such replacements as are ordered and countered by the Engineer shall be made. All replacement planting shall be in accordance with the requirements of the Contract application to initial plantings.

656.5-CARE DURING AND AFTER DELIVERY:

There is a great tendency for bare-root plants to dry out during shipment and during the planting operation; therefore it is extremely important that the roots of all plant material shall be kept moist during shipment and during the construction period.

656.6-METHOD OF MEASUREMENT:

Measurement of seedling plants will be by the number of plants initially planted in an acceptable manner and all such replacements as are ordered and planted in accordance with this Specification.

656.7-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, including water, topsoil, peat moss, limestone, fertilizer, and mulch, 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.

All replacements ordered by the Engineer will be paid for at the contract unit price for the item listed.

656.8-PAY ITEM:

ITEM	DESCRIPTION	UNIT
656001-*	Seedling, “scientific name”	Each

* Sequence number

September 7, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 665
PLUGGING GAS, OIL, AND DRILLED WATER WELLS

665.1-DESCRIPTION:

This work shall consist of plugging gas wells, oil wells, and drilled water wells as designated on the Plans. ~~This work shall also consist of plugging drilled water wells unless otherwise noted on the Plans.~~

665.2-MATERIALS:

665.2.1-Oil and Gas Wells: All materials used for plugging the oil wells and gas wells shall meet the requirements of the laws of the State of West Virginia.

665.2.2-Drilled Water Wells: Materials for plugging water wells shall meet the requirements of Division 700 as follows:

MATERIAL	SUBSECTION
Aggregate	703
Bentonite	715.45

Concrete shall be class D conforming to applicable requirements of 601 and may be with or without air entrainment at the option of the Contractor. The concrete shall be placed in accordance with current regulations of the Oil and Gas Division of the Department of Mines when a coal seam is involved.

CONSTRUCTION METHODS

665.3-GENERAL:

The ~~Division will~~ Contractor shall obtain all necessary permits, bonds, and licenses

required for this work.

665.4-PLUGGING GAS AND OIL WELLS:

The Contractor shall plug the gas well or oil well prior to starting any other construction in the vicinity of the well. The well shall be plugged using ~~bentonite mud and neat cement as provided for by law,~~ materials in accordance with local, state, and federal regulations and the work shall be accomplished by a qualified service company meeting the approval of the Gas and Oil Division of West Virginia Department of ~~Mines~~ Environmental Protection (WVDEP). All work pertaining to plugging the well must be performed under the supervision of the representative of the ~~Division of Mines~~ WVDEP. The Contractor shall notify the Project Engineer and the ~~Division of Mines~~ WVDEP at least 14 calendar days in advance of the date on which the Contractor intends to begin work.

~~The Division will make available upon request copies of Sections 9 and 10, Article 4, Chapter 22 of the Gas and Oil Laws.~~

665.5-PLUGGING DRILLED WATER WELLS:

The Contractor shall plug all drilled water wells within the right-of-way limits prior to starting any other work in the vicinity of the wells. The well shall be plugged using materials in accordance with local, state, and federal regulations and the work shall be accomplished by a qualified service company meeting the approval of the Gas and Oil Division of West Virginia Department of Environmental Protection (WVDEP); unless otherwise required, the water well shall be plugged with the following materials at the indicated intervals:

a) The wells shall be filled from the bottom with a mixture of aggregate and bentonite mud to within 20 feet ~~(6 m)~~ of the surface. The aggregate for each specific site may be any of the following AASHTO sizes: 7, 57, or 67. The bentonite shall be proportioned with fresh water as follows: eight percent bentonite by volume (minimum) to 92 percent by volume fresh water (maximum).

b) The final in-place product shall be a consistent mixture of bentonite mud and aggregate. The upper 20 feet ~~(6 m)~~ shall be plugged using Class D or other suitable concrete.

c) All coal seams of 24 inches ~~(600 mm)~~ or more in thickness or a seam that is being mined that the well encounters or passes through shall have Class D concrete placed from 30 feet ~~(9 m)~~ below the seam, if the well passes through the coal, or from the base of the coal seam, if the well ends within the coal seam, to 20 feet ~~(6 m)~~ above the coal seam.

d) The Contractor at their option may plug all drilled water wells from the bottom of the well to the surface with Class D or other suitable concrete in lieu of the bentonite mud and aggregate.

665.6-METHOD OF MEASUREMENT:

Plugging gas wells, oil wells, and drilled water wells will be measured by the unit.

665.7-BASIS OF PAYMENT:

The quantity, determined as provided above, will be paid for as provided below, which price and payment shall constitute full compensation to procure all permits and licenses, and for furnishing all material, labor, tools, equipment and all incidentals necessary to complete this work.

665.8-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
665001-*	Plugging Gas Well	Each
665002-*	Plugging Oil Well	Each
665003-*	Plugging Drilled Water Well	Each

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 689
METALIZING STEEL

689.1-DESCRIPTION:

This specification covers the requirements for thermal spray metallic coatings, with or without sealers or top coats, as a means to prevent corrosion of steel surfaces. All work shall be done at the steel fabrication shop unless otherwise specified.

The requirements outlined in the Society of Protective Coatings Guide for "Thermal Spray Metallic Coating Systems" (SSPC CS-Guide 23.00) shall be followed and considered as part of this specification.

689.2-MINIMUM REQUIREMENTS:

All metalizing work shall be performed by a company with at least three years of experience in coating steel. Any company which is new to metalizing and does not have three years experience shall, prior to starting any work, submit written documentation of successful structural steel metalizing projects. This shall include the name of the owner of previous projects, number and location of jobs completed, and number of years experience. This document will be reviewed, verified, and approved by the Engineer prior to beginning any work. The company shall possess knowledge and experience in all areas of surface preparation and metalizing work.

Each spray operator shall be qualified to metalize in conformance with the latest edition of ANSI/AWS C2.18. Spray operators not having evidence of qualification shall be prohibited from spraying.

689.3-MATERIAL:

Unless otherwise specified, the metallic coating to be applied shall be pure zinc, conforming to the requirements of ASTM B6.

The manufacturer shall furnish a Certificate of Analysis for each lot of material supplied. Each container or coil reel shall be properly labeled to identify component type, supplier, size, and wire lot number.

The size of wire material shall conform to the manufacturer's recommendations for the Arc

Sprayed method.

The metalizing material shall satisfy the requirements for at least a Class B slip coefficient and creep resistant per Appendix A of the "Specification for Structural Joints Using ASTM A-325 or A-490 Bolts" by the Research Council on Structural Connections. The test results shall be provided to the Engineer by the contractor prior to the start of work.

689.4-APPLICATION OF METALLIC COATING:

The metalizing unit shall be an arc type gun manufactured by an established domestic company. The equipment shall be used in conformance with the manufacturer's recommendations. No surface shall be sprayed which shows any signs of rust, scale or moisture. All metalizing shall be applied at 8 - 14 mils ~~(200 - 350 µm)~~ with no individual reading less than 6 mils ~~(150 µm)~~ nor more than 16 mils ~~(400 µm)~~. Field and/or shop bolted contact surfaces shall have the coating applied in the range of 2 to 5 mils ~~(25-125 µm)~~ dry film thickness. At least one layer of coating shall be applied within four hours after blasting and the final thickness within a maximum of eight hours of the blasting. The steel shall be cleaned with sharp, angular grit, to at least a near white finish meeting SSPC-SP-10. No shot will be allowed as the blasting abrasive. The profile of the anchor pattern shall be 2-4 mils ~~(50-100 µm)~~.

The top flange which will require shear studs shall have the metalizing applied at a minimum of 2 mils ~~(50 µm)~~ in order to prevent rusting. If applied in the shop, the studs shall be installed prior to metalizing. Metalizing of the studs is not required. If installed in the field, the shop applied metalizing on the top of the top flange shall be removed at the stud locations to bare metal prior to installation of the studs.

The contractor shall provide facilities to protect the finished metalized surface from damage during the blasting and thermal spraying work operations on adjacent areas. All damaged coated areas shall be properly repaired and remetalized at no additional cost to the Division.

Surfaces not intended to be metalized shall be suitably protected from the effects of the metalizing operations.

689.5-SEALERS AND TOP COATS:

The Division has the option of requiring a sealer and/or top coats over the metalizing. When this option is chosen, the requirements will be specified in the contract documents.

689.6-SHIPPING AND HANDLING:

All fully coated and cured assemblies shall be protected from handling and shipping damage with the prudent use of padded slings, dunnage, separators and tie downs. Loading procedures and sequences shall be designed to protect all coated surfaces. Any damaged areas shall be repaired in conformance with the manufacturer's recommendations or as directed by the Engineer.

689.7-FIELD TOUCH UP:

All touch up for metalizing shall be in conformance with the coater's recommendations.

689.8-METHOD OF MEASUREMENT:

The unit of measurement for "Metalizing Steel" shall be lump sum.

689.9-BASIS OF PAYMENT:

Basis of payment for "Metalizing Steel" shall be lump sum. Payment shall be full compensation for furnishing all the labor, tools, equipment, supplies, and incidentals necessary to complete the work herein prescribed.

689.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
689001-*	Metalizing Steel	Lump Sum
689002-*	Metalizing Steel With Sealer	Lump Sum
689003-*	Metalizing Steel With Sealer And Top Coats	Lump Sum

* Sequence number

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 102
BIDDING REQUIREMENTS AND CONDITIONS

102.1-ELIGIBILITY OF BIDDERS:

DELETE THE CONTENTS OF SUBSECTION 102.1 AND REPLACE THE FOLLOWING.

All bidders on projects let to contract by the Division shall be prequalified as provided for by rules or regulations, or both, of the Commissioner.

A Certificate of Qualification will be issued by the Commissioner ~~fixing~~ indicating ~~the amount of incomplete work a Contractor may have under contract at any one time with any entity and~~ the ~~type~~ categories of work for which the Contractor is qualified to perform for the Division.

To obtain a Certificate of Qualification, the Contractor must submit, on the form provided by the Division, a Contractor~~'s~~ Prequalification ~~Statement~~ Application containing the information as required based on the categor~~ies~~y ~~of~~ of work for which prequalification is being requested.

A completed Contractor~~'s~~ Prequalification ~~Statement~~ Application will be accepted by the Commissioner until 15 calendar days prior to the date set for receiving bids on projects on which the applicant may wish to submit a Proposal. Award of a certificate may be held in abeyance until such time as the Commissioner is able to verify all references and be satisfied as to the applicant's qualifications. No Contractor will be issued a Certificate of Qualification until the Division has had adequate time to review and verify the adequacy of the information provided in the Contractor~~'s~~ Prequalification ~~Statement~~ Application.

It is the bidder's responsibility to complete any Electronic Bidding registration required by the Division, and acquire all the necessary software, hardware, and networking capabilities for the Electronic Bidding process. It should be noted that only Prequalified Contractors or their authorized representatives will be approved to obtain, at their cost, an electronic bidder ID.

~~The Division may at its discretion allow a Contractor to submit a bid exceeding the prequalification amount allotted the Contractor provided it considers that this Contractor is particularly fitted by reason of their experience or equipment, or both, to perform the type of work involved. The prospective bidder should furnish the Division with a completed uncompleted workload form, provided in the Proposal Form, and a letter from a reputable Surety advising of their willingness to furnish a performance bond to the Contractor for the project on which the Contractor requests to exceed his or her prequalified amount.~~

~~No letter from a reputable Surety or uncompleted workload form shall be accepted after 4:00 PM Eastern Time on the Friday before project letting. Letters and forms are to be submitted via electronic mail to DOHContractorPrequalification@wv.gov. The Surety letter should include the following information: call number, project name, project number, and letting date for each project on which the Contractor requests to exceed their prequalification limit. Failure to submit this information by the specified time, incomplete submissions, those not submitted by electronic mail to the address listed above, and those not approved by the Division in writing before the opening of bids, may result in a Contractor's proposal(s) being irregular.~~

When more than one project is advertised, Proposals may be submitted on as many projects as the Contractor desires, providing the Contractor is qualified as described above for each individual project~~, but no contracts will be awarded exceeding the permissible limit of the Contractor's prequalification rating except as otherwise provided in Section 103.1~~. In addition, the Prime Contractor must be prequalified in the categories of work indicated in the proposal in a combination of those categories of work in order to perform work amounting to not less than 30% of the contract cost.

102.5-PROPOSAL SUBMISSION:

102.5.3-Notice to Contractors:

DELETE THE CONTENTS OF SUBSECTION 102.5.3 AND REPLACE THE FOLLOWING.

The bidder must complete all sections contained in the Notice to Contractors and check the box indicating he or she has read, understands, and intends to comply with all documents contained in the proposal.

i. Section A: Free Competitive Bidding Affidavit – Prior to the approval of Federal-Aid Contracts, a sworn statement in the form of an affidavit shall be executed by, or on behalf of, the person, firm, association, or corporation to whom such contract is to be awarded.

ii. Section B: Certification with Regard to the Performance of Previous Contracts or Subcontracts Subject to the Equal Opportunity Clause and the Filing of Required Reports.

iii. Section D: Assurance Requirement Regarding Equal Employment Opportunity for Vendors, Suppliers and Contractors Engaged in Commercial Transactions with the West Virginia Division of Highways.

iv. Section E: Contract Dates.

~~iv.~~v. Section F: Certificate of Compliance Involving the Supplying of Aluminum, Glass, Steel or Iron Products.

~~v.~~vi. Section H: West Virginia Contractor Licensing Act Chapter 21 Article 11 Code of West Virginia License Number – The proposal shall comply with West Virginia Contractor Licensing Act, Chapter 21, Article 11 Code of West Virginia, except that on Federal-Aid Projects a Contractor's license is not required at time of bid, but will be required before a project will be awarded.

~~vi.~~vii. Section I: Drug and Alcohol-Free Workplace – An affidavit that the Contractor implements and maintains a written drug-free workplace policy which meets the

requirements of Article 1D, Chapter 21 of the Official Code of West Virginia, as amended. The successful bidder must submit a copy of its drug-free workplace policy within ten (10) days following the letting and prior to the awarding of the contract. Any successful bidder who fails to submit the policy within the specified time limit will risk forfeiture of his/her proposal guaranty.

The successful bidder must also ensure that its subcontractors implement and maintain a written drug-free workplace policy complying with Article 1D, a copy of which must be submitted to the Division by the Contractor prior to the start of the subcontract work. The contract may be terminated if the Contractor:

a. Fails to implement its policy;
b. Fails to provide information regarding implementation of the policy at the request of the Division; or,
c. Provides to the Division false information regarding the policy.

A clearly legible copy of the written drug-free workplace policy must be kept posted in a prominent and easily accessible place at the project site by each contractor subject to the provisions of Article 1D.

Every Contractor shall keep an accurate record showing the names, occupation and safety- sensitive status of all employees, in connection with the construction on the project, and showing any drug tests or alcohol tests performed and employee education and supervisor training received, which record shall be open at all reasonable hours for inspection by the Division. The Contractor must preserve these records for three years after completion and acceptance of the project.

All drug testing information specifically related to individual employee is confidential and should be treated as such by anyone authorized to review or compile program records.

~~vii.~~viii. Section J: Amendment – Bidder must acknowledge that all amendments have been reviewed and considered in the bidder's proposal.

~~viii. Section L: Uncompleted Workload – Bidder must correctly acknowledge that the proposal they are submitting is within his or her prequalification limit or that an uncompleted workload form and letter from a reputable surety were submitted and approved in the prescribed timeframe, as detailed in Section 102.1.~~

ix. Section K: Blank.

x. Section L: Categories of Work – Bidder must acknowledge that they will perform, with their own organization, work amounting to not less than 30 percent of the total contract cost, as detailed in Section 108.1.

102.5.4-Bid Bond:

DELETE THE CONTENTS OF SUBSECTION 102.5.4 AND REPLACE THE FOLLOWING.

Bidders must verify his or her bid bond by completing the Bid Bond section of the electronic file~~, unless submitting a certified or cashier's check as described in Section 102.6~~.

102.6-PROPOSAL GUARANTY:

DELETE THE CONTENTS OF SUBSECTION 102.6 AND REPLACE THE FOLLOWING.

No proposal will be considered unless accompanied by a digitally signed proposal guaranty (bid) bond as described in Section 102.5.3 ~~or in the form of a certified or cashier's check in the amount specified in the Proposal,~~ made payable to the West Virginia Division of Highways. Bid bonds will be accepted only if executed on the official form furnished by the Division and any Proposal accompanied by a submitted electronically as described in Section 102.5.3. Any bid bond executed on a copy, duplicate, or facsimile will be rejected.

~~Cashier's Checks, when not utilizing an electronic bid bond, shall be submitted in an envelope and delivered prior to 4:00 PM Eastern Time the day before the scheduled letting. The Envelope and the Cashier's Check shall each contain the following Information:~~

~~Call Number~~	~~Letting Date~~
~~Project Number~~	~~Contractor's Name and Address~~

~~Envelopes shall be addressed to the West Virginia Division of Highways, Contract Administration Division, Charleston, West Virginia.~~

102.12-IRREGULAR PROPOSALS:

DELETE THE CONTENTS OF SUBSECTION 102.12 AND REPLACE THE FOLLOWING.

Proposals may be considered irregular and rejected for any of the following reasons:

i. When the Proposal is not submitted by the electronic file furnished by the Division on Bid Express or if the form is altered. Use of a Division approved computer generated Schedule of Items shall not be considered an alteration of form or format within the meaning of these Specifications.

ii. When there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the Proposal incomplete, indefinite, or ambiguous as to its meaning. Also, when Division approved computer generated Schedule of Items show any alteration of format, additions or amendments not called for, errors or omissions in units of measure, or erasures.

iii. When the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a Contract pursuant to an award. This does not exclude a bid limiting the maximum gross amount of awards acceptable to any one bidder at any one bid letting, providing that any selection of awards will be made by the Division.

iv. Failure to sign or properly execute the Proposal.

v. Failure to indicate a proposed goal in Section C of the Notice contained in the Proposal, when a Division determined goal is indicated in paragraph 5 of the Special Provision for Disadvantaged Business Enterprise Utilization.

vi. Failure to properly acknowledge receipt of amendment(s) in accordance with Section J of the notice contained in the proposal.

vii. Failure to show the West Virginia Contractor's License Number when required in Section H of the notice contained in the proposal.

viii. ~~When exceeding prequalification limits, Contractor's failure to properly complete Section L of the notice contained in the proposal and failure to submit an uncompleted workload form and a letter from a reputable Surety by 4:00 PM Eastern Time on Friday before project letting or if approval is not provided in writing by the Division, as described in Section 102.1.~~ The bidder is not prequalified in the categories of work indicated in the proposal in a combination of those categories of work in order to perform work amounting to not less than 30% of the contract cost.

ix. The proposal is mathematically and materially unbalanced. A mathematically unbalanced bid contains lump sum or unit price items that do not include reasonable labor, equipment, and material costs plus a reasonable proportionate share of the Bidder's overhead costs, other indirect costs and anticipated profit. A Materially Unbalanced Bid is when the Division determines that an award to the Bidder submitting a Mathematically Unbalanced Bid will not result in the lowest ultimate cost to the Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 103
AWARD AND EXECUTION OF CONTRACT

103.1-CONSIDERATION OF PROPOSALS:

DELETE THE CONTENTS OF SUBSECTION 103.1 AND REPLACE THE FOLLOWING.

After the proposals are opened, read publicly, and published, they will be compared on the basis of the summation of the products of the approximate quantities shown in the bid schedule by the unit bid prices. The results of such comparisons will be made available to the public after they are presented to the division's award committee. In the event of discrepancy between unit bid prices and extensions, the unit bid price shall govern.

The right is reserved to reject any or all proposals, to waive technicalities or to advertise for new proposals if, in the judgment of the ~~c~~Commissioner, the best interests of the state will be promoted.

~~If proposals for more than one project are issued to a bidder, which projects individually would be within the bidder's qualification established provided in 102.1, but a combination of more than one, considering also the work under contract and incomplete, would be in excess of their qualification, the right is reserved to consider only such proposal or proposals as, in the opinion of the commissioner, are most advantageous to the division. Additionally, consideration for such proposals submitted in excess of the bidder's prequalification limit may only be given to those for which an uncompleted workload form and letter from a reputable surety were submitted and approved by the division, in accordance with section 102.1.~~

Proposals containing special provisions for disadvantaged business enterprises utilization, will be considered as follows:

a) When the low bidder's goal submitted in Section C - DBE Utilization Certification, of the Notice contained in the project proposal, meets or exceeds the contract DBE goals, and the Division considers the amount of the bid to be reasonable,such bidder will be the successful bidder.

b) When the low bidder's goal submitted in Section C- DBE Utilization Certification, of the Notice contained in the project proposal, does not meet the DBE contract goal and the Division considers the amount of the bid to be reasonable, the bid will be accepted if he or she can show that good faith efforts were made prior to the bid to meet the contract goals.

c) When the low bidder cannot satisfy the Division that good faith efforts have been made,this bid may be rejected, and the second low bid will be evaluated in the same manner. This procedure will continue, evaluating bids in the same manner, evaluating bids in ascending order, until either the contract DBE goal is attained or good faith efforts canbe verified and that bid will be accepted provided the amount thereof is considered reasonable by the Division.

103.5-RETURN OF PROPOSAL GUARANTY:

DELETE THE CONTENTS OF SUBSECTION 103.5 AND REPLACE THE FOLLOWING.

All proposal guaranties, except those of the two lowest bidders, will be ~~–~~released ~~(if submitted electronically as described in Section 102.6) or returned (if submitted by certified or cashier's check as described in Section 102.6)~~ immediately following the opening and evaluating of the Proposals. The retained proposal guaranty of the unsuccessful of the two lowest bidders will be released ~~or returned~~ within 10 days following the awardof Contract, and that of the successful bidder will be released ~~or returned~~ after a satisfactory bond has been furnished, as described in Section 103.6, and the Contract has been executed.

103.6-REQUIREMENT OF CONTRACT BOND:

DELETE THE CONTENTS OF SUBSECTION 103.6 AND REPLACE THE FOLLOWING.

At the time of the execution of the contract, the successful bidder shall execute and deliver to the Division a good and sufficient surety or collateral bond payable to the State of West Virginia.

The successful bidder ~~has the option of submission of the aforementioned bond in an amount equivalent to either 102 percent or 100 percent of the contract price~~ is required to submit the aforementioned bond in the amount indicated by that bidder's published Performance Rating. ~~as shown~~ The Performance Rating in effect 15 calendar days prior to the bid letting shall apply. Performance Ratings and their corresponding bond amounts are available ~~shown below~~ in the Contractor Prequalification Application.

~~1) A 75 percent of the contract price~~
~~2) B 90 percent of the contract price~~
~~3) C 102 percent of the contract price~~
~~4) D 125 percent of the contract price~~
~~5) N 102 percent of the contract price~~

The submission of the aforementioned bond in ~~an amount equivalent to 102 percent of the contract price by the successful bidder~~the amount specified is the standard expectation of the Division in order to comply with the current Special Provision for Subcontractor Prompt Payment and does not necessitate the withholding of retainage by the Division from monies due on future

progress voucher estimates payable under the terms of the contract. ~~Further, the decision by a particular contractor to submit said bond in an amount equivalent to 102 percent~~The specified percentage of the contract price required for the bond shall be consistent and applicable throughout the duration of the contract for which the bond is being submitted and shall be consistent and applicable to all contracts executed between the Division and that particular contractor.

~~If the successful bidder elects to submit the aforementioned bond in an amount equivalent to 100 percent of the contract price, it is necessary that the bidder notify the Contract Administration Division in writing prior to the submission of the bond. Submission of a bond in an amount equivalent to 100 percent of the contract price does necessitate the withholding of retainage by the Division from monies due on future progress voucher estimates payable under the terms of the contract and as set forth in 109.6. Further, the decision by a particular contractor to submit said bond in an amount equivalent to 100 percent of the contract price shall be consistent and applicable throughout the duration of the contract for which the bond is being submitted and shall be consistent and applicable to all contracts executed between the Division and that particular contractor.~~

~~As an alternate, the successful bidder may deposit with the State Treasurer cash bond, United States Treasury bonds, United States Treasury notes, United States Treasury Certificates of Indebtedness, United States Treasury bills or West Virginia Road Bonds in the amount of either 102 percent or 100 percent of the contract amount. A safe keeping receipt from a bank located in the State of West Virginia may be deposited with the State Treasurer in lieu of any of the definitive securities.~~

~~The State Treasurer shall, on a regular basis, collect all interest or income on the obligations so deposited and shall pay same, when and if collected, to the Contractor who deposited the obligations. If the deposit is in the form of coupon bonds, the State Treasurer shall deliver each coupon as it matures to the Contractor.~~

September 21, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 108
PROSECUTION AND PROGRESS

108.1-SUBLETTING OF CONTRACT:

DELETE THE SECOND PARAGRAPH AND REPLACE THE FOLLOWING.

The Contractor shall request the approval of each subcontractor, including lower-tier subcontractors. No work shall be performed by a subcontractor until the subcontractor has completed a Contractor Prequalification Application, received a Certificate of Qualification from the Division in the categories of work the subcontractor will be providing on the project, and the request has been approved. Each subcontract, including lower-tier subcontracts, shall be in writing and shall physically contain all of the applicable provisions, requirements, specifications, and safety plans.The Contractor may certify that a copy of all the applicable provisions, requirements, specifications, and safety plans has been provided and is physically incorporated in each subcontract including lower-tier subcontracts. Requests for approval of DBE subcontractors, however, shall also be accompanied by a copy of the proposed subcontract without the required attachments.

September 21, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 109
MEASUREMENT AND PAYMENT

109.6-PARTIAL PAYMENTS:

DELETE THE CONTENTS OF SUBSECTION 109.6 AND REPLACE THE FOLLOWING.

The Engineer will make current estimates in writing, once each month on or before the date set by the Engineer at the time of starting the work, or from time to time as the work progresses, of the materials complete in place and the amount of work performed in accordance with the Contract, during the preceding month or period and the value thereof figured at the unit prices contracted. Current estimates may be prepared for payment on a semi-monthly basis at the discretion of the Engineer when the amount due the Contractor for work during the semi-monthly period exceeds $10,000. Should there be any doubt by the Engineer as to the integrity of any part of the completed work, the estimates for that portion will not be allowed until the cause for such doubt has been removed.

~~As set forth in 103.5, paragraph four, if the successful bidder submits a good and sufficient surety or collateral bond payable to the State of West Virginia in an amount equivalent to 100 percent of the contract price, an amount equivalent to two percent of the whole will be deducted from the total of the amounts ascertained as payable and will be retained by the Division until the completion of the entire Contract in an acceptable manner. The balance, or an amount equivalent to 98 percent of the whole, less all previous payments, will be certified for payment.~~

~~When the work under contract has been completed and its acceptance is recommended by the Engineer, and upon written request by the Contractor accompanied by proper release by the Contractor's surety, a part of the two percent retained as outlined above, in an amount determined by the Engineer, may be released and paid the Contractor. A minimum of 0.5% (zero point five percent) of the approximate total final contract amount will be retained until payment of the final estimate.~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING:

SECTION 613
SPRAY APPLIED AND SPIN-CAST PIPE LINING

613.1-DESCRIPTION:

This work shall consist repairing and rehabilitating culverts and storm drain pipes by filling voids and lining the entire interior surface of the pipe with factory blended cementitious or geopolymer material. Material may be spray applied, centrifugally spin-cast or applied with hand tools. Application methods may vary based on the size and shape of the culvert. The term "host pipe" refers to the existing pipe being rehabilitated. This is applicable for pipes ranging in size from 30" to 120".

The plans should include the following site information to facilitate design:

Factor	Description / Units
Extent of Deterioration	Fully, Partial, or Condition of the Pipe Being Rehabilitated
Size & Material	Length of the Pipe, Diameter, and Pipe Material (Corrugated Metal Pipe, Reinforced Concrete Pipe, etc.)
Ovality	What % is the Pipe's Deformity
Cover Depth (from crown)	How many Vertical Feet of Fill is Above the Crown of the Pipe
Soil Type (Density/Modulus)	Soil density (lb/ft3) E' in (psi)
Water Table (from invert)	Where is the water table in relation to the invert (ft)
Loading	Up to a HS-25 Truck load according to AASHTO the Pipe is required to take
Factor of Safety	2.0

613.2-MATERIALS:

Furnish materials for patching and filling voids conforming to the following.

Cementitious Materials	ASTM C1157
Geopolymer Materials	ASTM C1157, C989, C618

Furnished cementitious liner material that meets the following minimum property requirements:

Test Method	Test Property	Duration	Requirement	
AASHTO T 358	Surface Resistivity	28 Days	Minimum	14.3 kΩ-cm
ASTM C 109	Compressive Strength	1 day	Minimum	2500 psi
		28 Days	Minimum	8000 psi
ASTM C 1609	Flexural Strength	7 Days	Minimum	685 psi
		28 Days	Minimum	990 psi
ASTM C 418	Abrasion Resistance	28 Days	Maximum	0.085 cm^3 / cm^2
ASTM C 469	Modulus of Elasticity	28 Days	Minimum	3,360,000 psi
ASTM C 496	Tensile Strength	7 Days	Minimum	470 psi
		28 Days	Minimum	670 psi
ASTM C 1090	Height Change	28 Days	Maximum	-0.08%
ASTM C 1583	Bond Strength	28 Days	Minimum	615 psi
ASTM C 403	Set Time	Initial Set	Maximum	170 minutes
		Final Set	Maximum	300 minutes
ASTM C 666	Freeze Thaw	300 Cycles	40-0 °F and 0-40 °F in not less than 2 nor more than 5 hrs	
ASTM C 1202	Chloride Permeability	28 Days	Maximum	< 550 Coulombs

Furnished geopolymer liner material that meets the following minimum property requirements:

Test Method	Test Property	Duration	Requirement	
ASTM C109	Compressive Strength	28 days	Minimum	8000 psi
ASTM C78	Flexural Strength	28 days	Minimum	800 psi
ASTM C882	Bond Strength	28 days	Minimum	~~3000~~ 2500 psi
ASTM C469	Modulus of Elasticity	28 days	Minimum	5 x 10^6 psi
ASTM C1202	Chloride Ion Penetration Resistance	28 days	Maximum	~~250~~ 1000 Coulombs
ASTM C496	Split Tensile Strength	28 days	Minimum	~~900~~ 800 psi
ASTM C1090	Shrinkage	28 days	Maximum	0.02%
ASTM C666	Freeze Thaw	300 Cycles	40-0 °F and 0-40 °F in not less than 2 nor more than 5 hrs	
ASTM C1138	Abrasion Resistance	6 cycles at 28 days	Maximum	loss < 1.0%

613.3-SHIPMENT AND STORAGE:

Materials supplier and Contractor shall follow the manufacturer's recommendations for shipment and storage for all products, and ensure that the material safety data sheet accompanies the material.

The Contractor shall not use material from defective, punctured, or damaged containers and ensure that each container is labeled with a batch or lot number and an expiration or use by date. Contractor shall not use material that exceeds the use by date or useful life.

613.4-INSTALLATION PLAN:

The Contractor shall submit a written installation plan for the pipe renewal to the Engineer for acceptance at least ten calendar days before beginning work. The submission shall include the following information:

1. All calculations shall be performed and signed and sealed by a registered Professional Engineer in the state of West Virginia. The design of the rehabilitation system will be required to support the dead load and live load, address the spray liner physical properties, and the provide minimum lining thicknesses. The minimum allowable thickness is 0.5 inch; where bolts are present, a minimum 0.5 inch thickness over the bolt is required. The calculated minimum finished thickness of the liner shall be based on a maximum possible crack width of 0.01 inch with a factor of safety of 2.0. Liner thicknesses do not have to be uniform.
2. Required minimum lining thickness, invert lining thickness, and proposed manufacturer's material.
3. Method of cleaning the host pipe.
4. Plan to bypass flow around the host pipe.
5. Method to verify applied thickness during installation.
6. Video survey of the host pipe before installation.
7. Site specific health and safety plan.
8. A certification letter from the manufacturer stating that the contractor is an approved installer of the material.

The Contactor cannot make any changes or deviations from the accepted submittals without resubmitting and approval by the Engineer. The Engineer will not grant an extension of time because of incomplete or subsequent submittals.

During construction, the contractor shall submit the following information to the Engineer:

1. Test results that demonstrate the liner material meets the material requirements.
2. Daily thickness measurements of the spray material.
3. Temperature and humidity readings in the host pipe.

613.5-CONSTRUCTION:

A. **Preparation.** Remove all debris and obstructions from the host pipe. Clean and prepare the surface of the host pipe according to the manufacturer's recommendations.

B. **Flow Bypass.** Prevent the accumulation and flow of water through the host pipe and liner until after the work is complete. When required, bypass flows around the host pipe in

accordance with the requirements of the contract documents. After the lining process begins, maintain the bypass flow until the lining process, including curing, is complete. All immediately connected manholes and inlets should be plugged to prevent water from coming through the host pipe. Comply with USACE 404 and NPDES permits if applicable.

C. **Preinstallation inspection.** After cleaning and before beginning the lining process, inspect the host pipe to ensure there are no obstructions that would hinder the lining process. Perform a pre-installation video survey of the host pipe and provide a copy of the video to the Engineer.

D. **Installation.** Measure and record the temperature and humidity. The upper limit ambient and surface temperature is 100 Degrees Fahrenheit. The lower limit is 45 Degrees Fahrenheit when ambient temperatures are expected to fall below within 72 hours of placement. Suspend work if conditions are expected to be outside the acceptable range.

Patch corrugations, holes, and gaps in the host pipe with an approved hydraulic cement or the same cementitious or geopolymer based material to be used for the liner to provide a solid continuous surface on which to spray. Completely stop water infiltration into the host pipe.

Protect walls, surfaces, streambed and plants at the entrance and exit of the host pipe from overspray. Apply the material to the prepared surface using methods that provide a uniform surface. Use only equipment recommended by the manufacturer to perform the spray lining. Minimize hand troweling to the extents practicable.

Record the batch or lot number from the containers and weight of material used each day.

For cementitious or geopolymer material, prepare 3 specimens for the 1 day and 3 specimens for the 7 day and 3 specimens for the 28-day test as required per ASTM C109. Prepare an additional 3 specimens for reserve for a total of 12 test specimens. Utilize an ACI Certified level one sample technician or WVDOH equivalent to properly obtain and transport the test ~~specimens~~ material to the ~~District's Materials Lab~~ MCS&T laboratory or an accredited third-party laboratory for ASTM C109 testing. The material is to be sampled for testing on the first day and last day of use of pipe lining as well as every 42,000 lbs of lining on the project. Conduct air testing daily to ensure cementitious or geopolymer material is within manufacturers specifications.

Ensure the liner is continuous over the entire length of the host pipe and free from defects such as foreign inclusions, holes, and cracks larger than 0.01 inches wide. Ensure the renewed pipe is impervious to infiltration and exfiltration.

613.6-AFTER INSTALLATION:

The Contractor shall repair all defects in the liner as directed by the Engineer. All repairs shall be at no additional expense to the Division.

Perform non-destructive testing to verify liner thickness at the crown, invert, and spring lines at an interval of 20 ft for the entire length of the liner. Ensure the accuracy of the pachometer by physically measuring the liner thickness at the ends of the pipe or by other methods accepted by Engineer. Other non-destructive testing methods may be used if accepted by the Engineer. Furnish all the measurements to the Engineer.

613.7-WARRANTY:

For project located on NHS Routes, the Contractor shall provide a one-year written Manufacturer Material warranty which shall warrant all work against defects in materials and workmanship. The Manufacturer shall replace or repair any lining system components demonstrating unsatisfactory performance or durability within the one-year period commencing from the date of completion of the contract. All material, labor costs, and all other items need to install (including traffic control and incidentals) shall be paid by the Manufacturer.

613.8-METHOD OF MEASUREMENT:

If required, invert and void repair will be incidental to the pipe lining work. "Spray Applied or Spin Cast Pipe Lining" will be paid measured by the linear foot of accepted pipe covered by required minimum thickness.

613.9-BASIS OF PAYMENT:

Payment for "Spray Applied or Spin Cast Pipe Lining" includes submittals, excavation, backfill, encasement, preparation, flow bypass, inspections, and all other work and incidentals required to complete the specified items.

613.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
613002-*	"size" Spray Applied or Spin Cast Pipe Lining	Linear Feet

* Sequence Number

"size" Nominal diameter of host pipe being lined

October 27, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 703
COARSE AGGREGATE

703.1-CRUSHED AGGREGATE:

703.1.1-General Requirements:

DELETE THE CONTENTS OF SUBSECTION 703.1.1 AND REPLACE THE FOLLOWING.

Crushed stone shall consist of particles of clean, hard, tough, durable rock free from adherent coatings and shall contain only the mineral composition declared by the producer/supplier. Aggregates that do not meet these requirements are subject to being restricted to limited application. Limited application is defined as material that is only approved for use in applications covered by Section 704. The approval process for coarse aggregates is governed by MP 700.00.56.

November 2, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 709
METALS

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

~~All bar reinforcement, whether deformed or plain, shall meet the requirements of AASHTO M31 or AASHTO MP18 and be NTPEP certified where applicable. All reinforcement for use in structures shall be labeled to correspond with marks on the plans before being shipped to the job site.~~

~~When reinforcing steel material is furnished by a supplier who is not certified under provisions of MP 709.01.50, with either epoxy coated or plain bar, the supplier shall at their expense be required to have each heat or lot of material to be furnished to the Division sampled by a Division approved inspection agency in accordance with MP 700.00.01 and shall have the samples tested for compliance with the governing specification by a Division approved laboratory. The test and inspection information shall be furnished in the Division approved computer acceptable format.~~

~~Epoxy coated reinforcing steel shall meet the requirements of ASTM A775, except that Section 12.1 of ASTM A775 shall be deleted and replaced with the following. The Contractor shall repair any damage to epoxy coating of reinforcing steel that occurs during shipment, storage and installation of the steel. The sum of all damage areas in each one foot (300 mm) length of bar shall not exceed two percent of the bar area. The total bar surface area covered by patching material shall not exceed five percent. All field handling and patching requirements shall conform to ASTM D3963.~~

DELETE THE HEADING AND CONTENTS AND REPLACE WITH THE FOLLOWING:

709.1-PLAIN BLACK STEEL BARS FOR CONCRETE REINFORCEMENT:

All plain black steel bar reinforcement shall be supplied by manufacturers meeting the testing requirements of ASTM A615 or AASHTO MP18 and be an active participant in the National Transportation Product Evaluation Program "NTPEP" as well as conforming to M.P. 709.01.50.

709.1.1-Stainless Steel Bars for Concrete Reinforcement: For corrosion resistant stainless steel, the material shall meet testing requirements of tensile, yield, elongation, and

bend requirements listed in ASTM A955/955M and meet requirements set forth in MP 709.1.50 unless otherwise stated in the project plans.

709.1.2-High Chromium Steel Bars for Concrete Reinforcement: For corrosion resistant high chromium steel, the material shall meet testing requirements of tensile, yield, elongation, and bend requirements listed in ASTM A1035/1035M and meet requirements set forth in MP 709.1.50 unless otherwise stated in the project plans.

ADD THE FOLLOWING SUBSECTION:

709.1.3-Galvanized Coated Bars for Concrete Reinforcement: For galvanized coated reinforcing steel the material shall be selected meeting WVDOH specification 709.1 and the galvanized coating shall meet ASTM A767 for immersion process or ASTM A1094 for material using continuous hot dip galvanizing process.