20220406 - April's Specifications Committee Meeting

April Specifications Committee Meeting Agenda

Meeting Date

Wednesday, April 6, 2022 @ 9:00am

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

Approved Permanent Specification changes from last Committee meeting (2/2/22)

- **None**

Approved Project Specific Special Provisions (SP) from last Committee meeting (2/2/22)

- **SP601-Ultra High Performance Concrete**
- **SP207-Settlement Plate**

Items removed from Committee Agenda

- **None**

Old Business-Provisions discussed at last Committee meeting

SECTION	TITLE	DESCRIPTION
410	**Section 410-Asphalt Base and Wearing Courses, Percent within Limit (PWL)** Champion: Industry and management	**8th time to Committee.** Proposed specification change to Section 410. This specification incorporates suggestions is from Industry (these changes are redline copy showing the proposed changes). The specification has been updated and removes the bonuses from it. These changes are redline copy with yellow highlights showing these proposed changes. The provision has been update with minor editorial changes added.

636 **710** **715**	**636.20-Temporary Traffic Signals or Temporary Lighting, 636.23.16-Temporary Traffic Signal , 636.23.23-Temporary Lighting and 636.25-Pay Items** **710.8-Service, Lighting, and Class D Traffic Signal Poles** **715.42.9.3-Wood Pole Signal Support (Type D)** T. Whitmore	**4th time to Committee. Discussed in October, December, & February.** Specification changes to Section 636-Maintaining Traffic. The update clarify the temporary traffic signal requirements. No update to the specification; it is redline copy showing the proposed changes. **1st time to Committee.** Two specification changes in Division 700 related to Type D Traffic Signal Poles: 1. Section 710, Subsection 710.8-Service, Lighting, and Class D Traffic Signal Poles 2. Section 715, Subsection 715.42.9.3-Wood Pole Signal Support (Type D)
613	**SP613-Spray Applied Pipe Liner** A. Gillispie	**Update to previously approved SP. 3rd time to Committee. Discussed in December & February.** Project Specific Special Provision on Spray Applied Pipe Liner. The revision updates the material and testing requirements. The provision has been updated per comments at the last meeting; it is redline copy showing the revisions. Approval is expected in April.
703	**703.1.1-General Requirements** R. Shuman	**3rd time to Committee. Discussed in December & February.** 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. No update to the specification; it is redline copy showing the revisions. Approval is expected in April.
108	**108.7.1-Failure to Complete on Time and Liquidated Damages** S. Boggs	**2nd time to Committee. Discussed in February.** Specification change to Section 108-Prosecution and Progress. The revision updates Table 108.7.1-Schedule of Liquidated Damages. No update to the specification; it is redline copy showing the revisions. Approval is expected in April.

605	**605.2-Materials, 605.4-Method of Measurement, & 605.6-Pay Items** S. Boggs	**2nd time to Committee. Discussed in February.** Specification change to Section 605-Manholes and Inlets. The revision clarifies materials for perforated slot inlets and adds items for Modified Inlet and Modified Manhole. No update to the specification; it is redline copy showing the revisions. Approval is expected in April.
601 **679**	**601.12-Water Temperature** **679.3-Water Temperature** M. Perrow	**2nd time to Committee. Discussed in February.** Two specification changes related to controlling water temperature of concrete curing: 1. Section 601, Subsection 601.12-Water Temperature 2. Section 679, Subsection 679.3-Water Temperature No update to the specifications; they are redline copy showing the revisions. Approval is expected in April.
501 **511** **601** **603** **620** **679**	**501.4-Test Methods** **511.3.6.1-Testing** **601.4.1-Sampling and Testing Methods** **603.6.4-Sampling and Test Methods** **620.5.5.1.2-Compression Testing** **679.2.2-Specialized Concrete Mix Design and Testing** M. Perrow	**2nd time to Committee. Discussed in February.** Six specification changes related to AASHTO name change T23 to R100. 1. Section 501, Subsection 501.4-Test Methods 2. Section 511, Subsection 511.3.6.1-Testing 3. Section 601, Subsection 601.4.1-Sampling and Testing Methods 4. Section 603, Subsection 603.6.4-Sampling and Test Methods 5. Section 620, Subsection 620.5.5.1.2-Compression Testing 6. Section 679, Subsection679.2.2-Specialized Concrete Mix Design and Testing No update to the specifications; they are redline copy showing the revisions. Approval is expected in April.

New Business - New Provisions for Spec Committee

SECTION	TITLE	DESCRIPTION
102	**102.5.3-Bidding Requirements** S. Danberry	**1st time to Committee.** Specification change to Section 102-Bidding Requirements and Conditions. The revision revised the 102.5.3 subsection title and clarifies the Categorizes of Work requirements. The specification is redline copy showing the revisions.

106 **107** **109** S. Danberry	**106.1-Source of Supply and Quality Requirements** **107.8.2.1-Contractor's Public Liability Insurance and Protective Public Liability Insurance & 107.8.2.2-Railroad Protective Liability Insurance** **109.4.5-Contract Bond & 109.4.6-Insurance**	**1st time to Committee.** Three specification changes updating references to Section 103 so that they are in line with the revision to Section 103 in 2022 Supplemental. 1. Section 106, Subsection 106.1-Source of Supply and Quality Requirements 2. Section 107, Subsection 107.8.2.1-Contractor's Public Liability Insurance and Protective Public Liability Insurance & 107.8.2.2-Railroad Protective Liability Insurance 3. Section 109, Subsection 109.4.5-Contract Bond & 109.4.6-Insurance The specification are redline copy showing the revisions.
508 **720** B. Whelan	**508.9-Smoothness** **Section 720-Smoothness Testing**	**1st time to Committee.** Two specification changes removing bonus structure from Section 508 and Section 720. 1. Section 508, Subsection 508.9-Smoothness 2. Section 720-Smoothness Testing The specification are redline copy showing the revisions.
601 A Thaxton	**601.5.2.3-Scales**	**1st time to Committee.** Specification change to Section 601. The revision adds reference to MP. The specification is redline copy showing the revisions.
622 S. Boggs	**SP622-Cantilever Mailbox**	**1st time to Committee.** Project Specific Special Provision (SP) for cantilever mailbox.
636 **104**	**636.2-Materials, 636.6.2-Shadow Vehicle, 636.9-Traffic Control Devices, 636.12-Temporary Impact Attenuating Devices, & 636.23.6-Traffic Control Devices** **104.13-Funding**	**1st time to Committee.** Three specification changes updating NCHRP-350 reference dates, funding source sign, and better organize 636.9. 1. Section 636, Subsection 636.2-Materials, 636.6.2-Shadow Vehicle, 636.9-Traffic Control Devices, 636.12-Temporary Impact Attenuating Devices, & 636.23.6-Traffic Control Devices 2. Section 104, Subsection 104.13-Funding Source Identification Signs 3. Section 715, Subsection 715.9.3-Channelizing Devices, 715.9.3.4-Barricades, 715.9.3.5-Surface Mounted Flexible Tubular Markers, 715.9.6-Portable Sign Stands

	Source Identification Signs **715.9.3-Channelizing Devices, 715.9.3.4-Barricades, 715.9.3.5-Surface Mounted Flexible Tubular Markers, 715.9.6-Portable Sign Stands** T. Whitmore	The specification are redline copy showing the revisions.
658	**658.5.6.3-Installation Procedure** T. Whitmore	**1st time to Committee.** Specification change to Section 658-Overhead Sign Structure. The revision updates nut tightening process for overhead structures and adds reference to MP. The specification is redline copy showing the revisions.
665	**SP665-Water Well Survey** S. Boggs	**1st time to Committee.** Project Specific Special Provision (SP) for water well survey.
663 **711** **715**	**663.2-Materials, 663.5.2-Temporary and Permanent White or Yellow Traffic Zone Paint, & 663.5.5-Type V Preformed Intersection Traffic Markings** **711.40-Temporary White or Yellow Traffic Zone Paint & 711.41-White or Yellow Fast-Dry Traffic Paint (Types II And IX)** **715.40.2-Preformed Intersection Traffic Markings (Type V Material), 715.40.3-Interim Pavement Markings (Type VIIA Interim Pavement**	**1st time to Committee.** Three specification changes related to pavement markings; the revision adds Type IX markings, updates color and retrorefectiving testing equipment, and updates references. 1. Section663, Subsections 663.2-Materials, 663.5.2-Temporary and Permanent White or Yellow Traffic Zone Paint, & 663.5.5-Type V Preformed Intersection Traffic Markings 2. Section 711, Subsections 711.40-Temporary White or Yellow Traffic Zone Paint & 711.41-White or Yellow Fast-Dry Traffic Paint (Types II And IX) 3. Section 715, Subsections 715.40.2-Preformed Intersection Traffic Markings (Type V Material), 715.40.3-Interim Pavement Markings (Type VIIA Interim Pavement Marking Tape) & 715.40.4-Temporary Pavement Marking Tape (Types VIIB and VIIC)

	Marking Tape) & 715.40.4-Temporary Pavement Marking Tape (Types VIIB and VIIC) T. Whitmore	
704	**704.4-Dump Rock Gutter** D. Matics	**1st time to Committee.** Specification change to Section 704-Stone and Crush Aggregates. The revision clarifies the type of rock for dump rock gutter. The specification is redline copy showing the revisions.
709	**709.1-Steel Bars for Concrete Reinforcement** G. Hanna	**1st time to Committee.** Specification change to Section 709-Metals. The revision updates plain and deformed bar reinforcement and adds subsections for galvanized and epoxy coated reinforcement. The specification is redline copy showing the revisions.
715	**715.14.2-Approval of Bearing Pads without Shims** D. Simmons	**1st time to Committee.** Specification change to 715.14-Elastomeric Bearing Pads. The revision adds subsection for approval of bearing pads without shims. The specification is redline copy showing the revisions.
221	**SP221-Rockfall Mitigation** T. Priddy	**1st time to Committee.** Project Specific Special Provision (SP) for the following rockfall mitigation items: Rock Slope Scaling; Pinned Wire Mesh; Slope Drape; Rockfall Attenuator Barrier; Attenuator Barrier Drape; and Rockfall Barrier.

Comments

Comments are requested on these Specifications Changes and Project Specific Special Provisions. Please share your comments by **April 4, 2022**, they help in the decision making process.

Please Send Comments to: DOHSpecifications@wv.gov

Deadline for new items & updates to these provision is May 5, 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, **June 1, 2022 at 9:00 a.m.**
Meeting will be held virtually via Google Meet video conference. E-mail distribution message includes instruction.

2017 Standard Specification Roads and Bridges & 2022 Supplemental Specifications

Electronic Copy (pdf): The 2017 Standard Specifications Roads & Bridges & 2022 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: We are out of hard copies of the 2017 Standard Specifications Roads and Bridges. Hard copies of the 2022 Supplemental Specifications are available thru Technical Support Division. 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 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 410.10.1. ~~3 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, 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	100
75-89	[(0.5)PWL]+55
55-74 Note ~~2~~ 1	[(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~~ 1 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~~ lots with a PWL less than or equal

to 60. Price adjustments shall be calculated using the formula~~s~~ below. There will be no adjustment for joint lots who's PWL ~~falls between 60 and 80~~ is greater than 60.

~~Bonus adjustment calculated as follows:~~

~~$T = \frac{PWL-80}{20}$ 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~~ is greater than 70.

~~Positive adjustment calculated as follows:~~

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

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%~~ 98.00%	100
88.00% to 91.49%	= 100 – 4*(91.50% - Percent density)
Less than 88%	= 84 – 10*(88% - Percent density) Note 2

Note 1 High mat density is 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 decreases, 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 linear 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 97.00%	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)]~~
100.00 and Greater	0
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

~~November 10, 2021~~ January 27, 2022

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 SIGNALS OR TEMPORARY LIGHTING:

636.20.1-Temporary Traffic Signals: Temporary traffic signal work may involve temporary modifications to existing permanent traffic signals or the installation of temporary signals. Temporary signal installations may entail the installation of traffic signals and associated equipment using wood pole supports, or the use of portable temporary traffic signal trailers. Individual signals or trailers at specific project Plan designated locations shall be interconnected and programmed to operate in a coordinated manner as a system. Temporary traffic signal work shall consist of furnishing, installing, maintaining, adjusting, and subsequent removal of various types of traffic signal components and equipment 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 signals in accordance with Section 660 and Subsection 715.42 of the Specifications. As a minimum, ~~the~~ temporary traffic signals shall be equipped with ~~a~~ three-dial fixed time controllers. When ~~the~~ temporary traffic signals are no longer needed, they will become the property of the Contractor. Existing permanent signals shall be modified as detailed in the plans to match the traffic pattern for each phase of construction work and shall be returned to their original condition at the completion of the project.

Wood pole temporary traffic signal installations shall be in conformance with Standard Details Book Volume II sheet TES-23, Section 715.42.9.3, and Section 710.8.

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: "Temporary Traffic Signal" shall include the furnishing~~,~~ and installation~~,~~ of complete and operational temporary traffic control signals. It shall also include adjusting and/or furnishing equipment and/or components for existing traffic signals 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~~s~~ and paid by the month, or fraction thereof, or 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 Signals, Wood Pole Note 1	Lump Sum
636023-002	Temporary Traffic Signals, ~~"location"~~ ~~Note 1~~ Portable Note 2	Month
636023-003	Temporary Traffic Signals, Modification to Permanent Traffic Signals	Lump Sum

Note 1 Wood pole supported temporary signals are only to be specified for projects 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 Units shall be computed as the total combined number of months that each portable temporary traffic signal trailer is operational on the project.

January 27, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 710
WOOD MATERIALS

710.8-SERVICE AND LIGHTING POLES:

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

710.8-SERVICE, ~~AND~~ LIGHTING, AND TYPE D TRAFFIC SIGNAL POLES:

Wood Service or lighting poles shall be ANSI Class 5, or larger, or as called for on the contract plans. Lighting poles shall be southern yellow pine and service poles shall be either southern yellow pine or Douglas fir.

Type D traffic signal poles shall be ANSI O5.1 Class 3 or greater, or as called for on the contract plans. Species shall be either southern yellow pine or Douglas fir. Poles shall not have more than 180 degree twist in grain over the full length and the sweep shall be no more than 4 inches.

The poles shall be pressure-treated) to meet the requirements of American Wood Protection Association (AWPA) Standard U1 UC4C (Commodities Specification D: Poles).

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.42-TRAFFIC SIGNAL MATERIALS AND EQUIPMENT:

715.42.9-Signal Supports:

715.42.9.3-Wood Pole Signal Supports (Type D):

715.42.9.3.1-General Description:

DELETE THE FIRST SENTENCE OF THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

~~The shaft length and diameter of the poles shall be as described on the Plans.~~Shaft lengths of the poles shall be as described on the Plans.

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SUBSECTION:

ANSI O5.1 Class and material requirements for the poles shall be as specified in Section 710.8.1.

DELETE SUBSECTIONS 715.42.9.3.2 AND 715.42.9.3.3

~~**715.42.9.3.2 Material:** Poles shall not have more than 180 degree twist in grain over the full length and the sweep shall be no more than 4 inches (100 mm).~~

~~**715.42.9.3.3 Treatments:** Poles shall be pressure treated in accordance with Section 710 of the Specifications.~~

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~~"~~ inch to 120~~"~~ inch diameter.

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~~ HL-93 Live Truck load according to AASHTO the Pipe is required to take
Factor of Safety	2.0

613.2-MATERIALS:

The materials in the product shall meet the requirements of ASTM C387, ASTM C150, and ASTM C595. In addition a geopolymer cement may be used. ~~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 C88~~	~~Bond Strength~~	~~28 days~~	~~Minimum~~	~~3000 psi~~
~~ASTM C469~~	~~Modulus of Elasticity~~	~~28 days~~	~~Minimum~~	~~5 x 10^6 psi~~
~~ASTM C1202~~	~~Chloride Ion Penetration Resistance~~	~~28 days~~	~~Maximum~~	~~250 Coulmbs~~
~~ASTM C496~~	~~Split Tensile Strength~~	~~28 days~~	~~Minimum~~	~~900 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%~~

Furnished liner materials that meets the following property requirements:

Test Method	Test Property	Duration	Requirement
ASTM C109	Compressive Strength	28 days	8000 psi
ASTM C469	Modulus of Elasticity	28 days	3.3 x 10^6
ASTM C1090	Height Change	28 days	Maximum - 0.1%
ASTM C666	Freeze Thaw	300 cycles	40-0 °F and 0-40 °F in not less than 2 nor more than 5 hrs
ASTM C1202	Chloride Permeability	28 days	Maximum 1000 Coulombs
ASTM C1138 or ASTM C418	Abrasion Resistance	6 cycles at 28 days or 28 days	Maximum loss of < 1.0% or Maximum loss of 0.085 cm^3/cm^2
ASTM C1609 or ASTM C78	Flexural Strength	28 days	800 psi

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

material specimens 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~~ 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.

January 18, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 108
PROSECUTION AND PROGRESS

108.7-COMPLETION DATES:

108.7.1-Failure to Complete on Time and Liquidated Damages:

DELETE TABLE 108.7.1 AND REPLACE WITH THE FOLLOWING:

TABLE 108.7.1
Schedule of Liquidated Damages

Original Contract Amount		Daily Charges
For More Than	To and Including	Per Calendar Day
$0	$500,000	~~$300~~ $350
$500,000	$2,000,000	~~$600~~ $650
$2,000,000	$10,000,000	~~$1,500~~ $1,600
$10,000,000	$25,000,000	~~$3,000~~ $3,100
$25,000,000		~~$4,000~~ $4,200

December 20, 2021

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 605
MANHOLES AND INLETS

605.2-MATERIALS:

DELETE THE TABLE AND REPLACE WITH THE FOLLOWING:

MATERIAL	SUBSECTION
Aggregate for Perforated Slot Inlets (Aggregate For Fabric Underdrain)	606.2
Clay or Shale Brick	715.16
Concrete Brick	715.17
Concrete Masonry Blocks	715.18
Fabric for Perforated Slot Inlets	715.11
Gray Iron Castings	709.10
Joint Mortar	708.8
Manhole Steps	709.10, 715.19, 715.38
Pipe for Slot Inlets	713.2

605.4-METHOD OF MEASUREMENT:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Manholes and inlets, new, modified, or adjusted will be measured by the unit; slot inlets will be measured by the linear foot ~~(m)~~ in place.

605.6-PAY ITEMS:

ADD THE FOLLOWING ITEMS TO THE TABLE:

ITEM	DESCRIPTION	UNIT
605014-*	Modified Inlet, “type”	Each
605016-*	Modified Manhole, “type”	Each

DELETE ITEMS 605040 AND 605041 FROM THE TABLE AND REPLACE WITH THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
605040-*	“size” Perforated Slot Inlet ~~Riser~~	~~Each~~ Linear Foot
605041-*	“size” Slot Inlet ~~Riser~~	Linear Foot ~~(Meter)~~

January 5, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 601
STRUCTURAL CONCRETE

601.12-CURING AND PROTECTING CONCRETE:

601.12.1-Curing Under normal Conditions:

ADD THE FOLLWING AT THE END OF FIRST PARAGRAPH:

The temperature of the curing water shall not exceed the maximum ambient temperature of the last 24 hours by more than 5°F.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 679
OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS

679.3-CONSTRUCTION METHODS

679.3.7-Placing and Finishing Specialized Concrete Overlay

679.3.7.5-Curing

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

It is the nature of specialized concrete overlay material to quickly form a plastic film at the surface upon drying. This film is to be protected from drying and cracking by prompt covering with wet burlap. The temperature of the water for the wet burlap shall not exceed the maximum ambient temperature of the last 24 hours by more than 5°F. Regardless of the type of concrete placed, the use of membrane curing compounds will not be allowed. Floor drains shall be immediately unplugged to permit the deck to drain.

January 5, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 501
PORTLAND CEMENT CONCRETE PAVEMENT

501.4-TESTING:

501.4.1-Test Methods:

DELETE THE FIFTH LINE OF THE TABLE AND REPLACE WITH THE FOLLOWING:

~~Making and Curing Concrete Test Specimens in the Field~~ Standard Practice for Making and Curing Concrete Test Specimens in the Field	AASHTO ~~T 23~~ R 100 with MP 601.04.20

January 5, 2022

EST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 511
DOWEL BAR RETROFIT

511.3-CONSTRUCTION METHODS:

511.3.6-Mixing and Placing Backfill Material:

511.3.6.1-Testing:

DELETE THE CONTENTS OF SUBSECTION 511.3.6.1 AND REPLACE WITH THE FOLLOWING:

Fabricate a minimum of six compressive strength specimens in accordance with AASHTO ~~T 23~~ R 100 for each day of backfill placement. The compressive strength of an average of three of these specimens shall represent the compressive strength of all backfill material placed after the batch from which the previous compressive strength specimens were fabricated through the batch from which these specimens were fabricated.

January 5, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 601
STRUCTURAL CONCRETE

601.4-TESTING:

601.4.1-Sampling And Testing Methods:

DELETE THE SEVENTH LINE OF THE TABLE AND REPLACE WITH THE FOLLOWING:

~~Making and curing concrete compressive specimens~~ Standard Practice for Making and Curing Concrete Test Specimens in the Field	AASHTO ~~T 23~~ R 100 with MP 601.04.20

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 603
PRESTRESSED CONCRETE MEMBERS

603.3-CONCRETE:

603.6.4-Sampling and Test Methods:

DELETE THE FIRTH LINE OF THE TABLE AND REPLACE WITH THE FOLLOWING:

~~Making and Curing Concrete Test Specimens in the Field~~ Standard Practice for Making and Curing Concrete Test Specimens in the Field	AASHTO ~~T 23~~ R 100

January 5, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 620
THREE-SIDED REINFORCED CONCRETE BRIDGE/CULVERT

620.5-MATERIALS:

620.5.5-Testing and Inspection

620.5.5.1-Precast Three-Sided Bridge/Culvert

620.5.5.1.2-Compression Testing:

DELETE THE CONTENT OF THIS SUBSECTION AND REPLACE WITH THE FOLLOWING:

Cylinders shall be made and tested as prescribed by the AASHTO T-22 and ~~T-23~~ R-100 Specifications. Cores shall be obtained and tested for 474 compressive strength in accordance with the provisions of the AASHTO T280 Specification.

January 5, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 679
OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS

679.2-MATERIALS:

679.2.2-Specialized Concrete Mix Design and Testing:

DELETE THE TENTH PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Compressive strength specimens shall be made and cured in accordance with AASHTO ~~T~~ ~~23~~ R 100 and MP 601.04.20 at the frequency required in MP 601.03.50 except that specimens for latex modified concrete shall be moist cured for 2 days and air cured at a temperature of 73.5 ± 3.5 °F ~~(23 ± 2 °C)~~ for 26 days.

January 25, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 102
BIDDING REQUIREMENTS AND CONDITIONS

102.5-PROPOSAL SUBMISSION:

102.5.3 Notice to Contractors:

DELETE SUBSECTION TITLE AND REPLACE WITH THE FOLLOWING:

102.5.3- Bidding Requirements:

DELETE BULLET x. AND REPLACE THE FOLLOWING:

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. All categories of work in the contract for which the bidder is not prequalified to perform must be subcontracted to a contractor who is prequalified in those categories. Failure to meet the prequalification requirement may be basis for termination of the contract and the awarding of said contract to the next responsible bidder or readvertisement and letting of the contract. Any additional costs for said actions shall be the responsibility of the bidder.

January 25, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 106
CONTROL OF MATERIALS

106.1-SOURCE OF SUPPLY AND QUALITY REQUIREMENTS:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The material used on the work shall meet all quality requirements of the Contract. To expedite the inspection and testing of materials, the Contractor shall notify the Engineer of their proposed sources of materials as required in ~~103.10~~ 103.11. At the option of the Engineer, materials may be approved at the source of supply before delivery is started. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources at no increase in cost to the Division.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 107
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107.8-RAILWAY-HIGHWAY PROVISIONS:

107.8.2-Insurance:

107.8.2.1-Contractor's Public Liability Insurance and Protective Public Liability Insurance:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Commercial General Liability (CGL) coverage as required by Section ~~103.6.1~~ 103.7.1 shall be written with a $2,000,000 Each Occurrence Limit. This limit may be single limit of primary coverage or a combination of primary and excess coverage which will meet the $2,000,000 requirement. A certificate of insurance shall be provided to the Railroad before work begins and said certificate shall provide the Railroad thirty (30) days advance written notice of cancellation or material change in insurance coverage. If any part of the work is sublet, ~~Commercial General Liability~~ CGL Insurance and evidence thereof in the same amounts as required of the Prime Contractor, shall be provided by or in behalf of the subcontractor to cover his operations on railroad right of way.

107.8.2.2-Railroad Protective Liability Insurance:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

With respect to the operations performed by the Contractor or subcontractors of any tier the Contractor must provide in the name of Railroad. This policy shall be written on the ISO/RIMA Form of Railroad Protective Insurance (ISO Form CG00350690) with Pollution Exclusion Amendment ISO Form CG 28311185 or their equivalents). ~~The policy of insurance specified in this section shall be countersigned by a resident agent of the State of West Virginia in accordance with Section 103.6.5.~~ The original of the policy shall be submitted to and approved by the Railroad before work is commenced on its right of way or within 200 feet of the nearest track or 1000 feet if blasting is required for the construction.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 109
MEASUREMENT AND PAYMENT

109.4-FORCE ACCOUNT WORK:

109.4.5-Contract Bond:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The cost of premiums for contract bond required by ~~103.5~~ 103.6 which is extra cost and related to the force account work will be paid to the Contractor.

109.4.6-Insurance:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The cost of premiums for Contractor's Public Liability and Property Damage Liability Insurance required by ~~103.6.1~~ 103.7.1 and Contractor's Protective Public Liability and Property Damage Liability Insurance required by ~~103.6.2~~ 103.7.2 which is extra cost and related to the force account work will be paid to the Contractor.

March 7, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 508
DIAMOND GRINDING

508.9-SMOOTHNESS:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE THE FOLLOWING.

Smoothness of the riding surface shall be determined by the Engineer using an inertial profiler. ~~Smoothness incentives based on the International Roughness Index (IRI) shall be as follows:~~

~~TABLE 508.9 ENGLISH~~

~~Posted Speeds ≤ 45 mph~~		~~Posted Speeds > 45 mph~~	
~~Final IRI (inches/mile)~~	~~Incentive ($ per 0.1 mile section)~~	~~Final IRI (inches/mile)~~	~~Incentive ($ per 0.1 mile section)~~
~~0.00 - 70.00~~	~~$450.00~~	~~0.00 - 50.00~~	~~$450.00~~
~~70.01 - 100.00~~	~~-11*(IRI)+1220.00~~	~~50.01 - 65.00~~	~~-22*(IRI)+1550.00~~
~~100.01- 135.00~~	~~$0.00~~	~~65.01 - 80.00~~	~~$0.00~~

~~TABLE 508.9 METRIC~~

~~Posted Speeds ≤ 70 km/h~~		~~Posted Speeds > 70 km/h~~	
~~Final IRI (meters/km)~~	~~Incentive ($ per 0.1 km section)~~	~~Final IRI (meters/km)~~	~~Incentive ($ per 0.1 km section)~~
~~0.0000 - 1.1048~~	~~$450.00~~	~~0.0000 - 0.7892~~	~~$450.00~~
~~1.1050 - 1.5784~~	~~-950*(IRI) + 1499.56~~	~~0.7893 - 1.0259~~	~~-1899.54*(IRI) + 1949.12~~
~~1.5785- 2.1308~~	~~$0.00~~	~~1.0261 - 1.2627~~	~~$0.00~~

March 17, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 720
SMOOTHNESS TESTING

720.5-NATIONAL HIGHWAY SYSTEM (NHS) PAVEMENT PROJECT:

720.5.2-Schedule 1 NHS Pavement Projects:

DELETE TABLE 720.5.2 AND REPLACE THE FOLLOWING.

TABLE 720.5.2
Schedule 1 NHS Pavement Projects

IRI for each 0.1-mile section (in/mi)	Price Adjustment ($)
~~30.0 or Less~~	~~+600~~
~~30.1 to 60.0~~	~~-20(IRI) + 1,200~~
~~60.1 to~~ 65.0 or Less	0
65.1 to 95.0	-20(IRI) + 1,300
95.1 or Greater	Corrective Action Required

720.5.3-Schedule 2 NHS Pavement Projects:

DELETE TABLE 720.5.3 AND REPLACE THE FOLLOWING.

TABLE 720.5.3
Schedule 2 NHS Pavement Projects

IRI for each 0.1-mile section (in/mi)	Price Adjustment ($)
~~46.0 or Less~~	~~+600~~
~~46.1 to 76.0~~	~~-20(IRI) + 1,520~~
~~76.1 to~~ 80.0 or Less	0
80.1 to 120.0	1,200 - 15(IRI)
120.1 or Greater	-600

720.5.4-Schedule 3 NHS Pavement Projects:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE THE FOLLOWING.

NHS pavement projects with a pavement thickness less than three (3) inches and more than one (1) inch shall be classified as Schedule 3 NHS Pavement Projects. The final price adjustments for Schedule 3 NHS Pavement Projects shall be determined using the calculations shown in Table ~~720.5.3~~ 720.5.4. ~~Payment for any bonus on a project shall require the average IRI for the entire project to be 67 in/mi or less.~~

TABLE 720.5.4
Schedule 3 NHS Pavement Projects

IRI for each 0.1-mile section (in/mi)	Price Adjustment ($)
~~46.0 or Less~~	~~+300~~
~~46.1 to 76.0~~	~~-10 (IRI) + 760~~
~~76.1 to~~ 80.0 or Less	0
80.1 to 120.0	1,200 – 15 (IRI)
120.1 or Greater	-600

720.6-NON-NATIONAL HIGHWAY SYSTEM PAVEMENT PROJECTS:

DELETE THE ENTIRE SUBSECTION AND REPLACE WITH THE FOLLOWING.

~~**720.6 NON-NATIONAL HIGHWAY SYSTEM PAVEMENT PROJECTS:**~~

~~Pavement projects located on any Non-NHS routes shall be tested with equipment outlined in 720.2.1, 720.2.2 and 720.3 if the project meets all four of the following requirements:~~

~~1. Resurfacing is the primary project type~~
~~2. Greater than 1 mile of continuous pavement,~~
~~3. Edge lines and center line on the new pavement in accordance with Section 663.~~
~~4. Thickness of one inch (1) or more of new pavement (including scratch if used)~~

~~**720.6.1 Ride Quality Analysis Before Project:** Non-NHS pavement projects shall be tested before the pavement project begins. Any new construction of a Non-NHS route will be evaluated as an NHS route according to 720.5.~~

~~**720.6.2 Data Source Collection After Project Completion:** The data source collection after project completion shall be collected by the Division's high-speed or low-speed inertial profiler as referenced in 720.3.2. On non-NHS routes Quality Control Testing is optional for the contractor.~~

~~**720.6.3 Final Price Adjustments:** Final price adjustment incentives shall be calculated using percent improvement. 0.1-mile sections of after project completion data with an IRI of 170 in/mi or greater will be ineligible for final price adjustment and if the average percent~~

~~improvement for the entire project is less than fifty percent (50%) the project will not be eligible for price adjustments. If the average percent improvement is more than fifty percent the final price adjustments for non-NHS pavement projects shall be determined using the calculations shown in Table 720.6.5.~~

~~TABLE 720.6.3~~

~~Non-NHS Pavement Projects~~

~~Percent Improvement (%)~~	**~~Price Adjustment Incentive ($ per 0.1-mile Section)~~**
~~50.1 or Greater~~	~~18 (Percent Improvement) – 700~~
~~50.0 or Less~~	~~0~~

~~Where:~~

$$\text{Percent Improvment (\%)} = \frac{\text{Before IRI of Lot} - \text{After IRI of same Lot}}{\text{Before IRI of Lot}} \times 100$$

720.6-BLANK

720.7-PROJECT THAT DO NOT FALL UNDER PREVIOUS CHARACTERIZATIONS:

DELETE THE SUBSECTION TITLE AND REPLACE WITH THE FOLLOWING.

720.7-PROJECTS THAT DO NOT FALL UNDER PREVIOUS CHARACTERIZATIONS:

March 1, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 601
STRUCTURAL CONCRETE

601.5-EQUIPMENT AND TOOLS:

601.5.2-Batching Plant And Equipment:

601.5.2.3-Scales:

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

Scales shall be inspected and sealed as often as the Engineer deems necessary to ensure their continued accuracy and as outlined in MP 700.00.30. The Contractor shall have on hand not less than ten 50 lb. weights for frequent testing of all scales.

March 14, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING

SECTION 622
CANTILEVER MAILBOX SUPPORT

622.1-DESCRIPTION:

This work shall consist of constructing a new mailbox support, removing existing mailbox support, or relocating the existing mailbox onto new support at locations as shown on the plans or directed by the Engineer.

622.2-MATERIALS:

All wood shall be pressure treated pine, meeting requirments of 710.3 or 710.5 of Specifications. Testing of the materials will not be required.

622.3 through 622.4-BLANK

622.5-CONSTRUCTION METHODS:

Unless otherwise noted in the plans, Cantilever Mailbox Support shall be constructed per Typical Sections and Related Details at locations as shown on the plans or directed by the Engineer.

622.6-METHOD OF MEASUREMENT:

The quantity of cantilever mailbox supports will be measured per each, complete in place and accepted.

622.7-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 prices and payment shall be full compensation for furnishing all

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

662.8-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
622003-001	Cantilever Mailbox Support	Each

February 22, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 636
MAINTAINING TRAFFIC

636.2-MATERIALS:

DELETE TRAFFIC CONTROL FROM THE TABLE AND REPLACE WITH THE FOLLOWING:

MATERIAL	SUBSECTION
~~Traffic Control~~	~~715.9~~
Traffic Control Devices	Division 700 subsections referenced in Section 636.9

636.6-PILOT TRUCK AND DRIVER OR SHADOW VEHICLE:

636.6.2-Shadow Vehicle:

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

A shadow vehicle shall be furnished by the Contractor and used at the locations called for on the Plans or directed by the Engineer. A Shadow Vehicle shall consist of a commercial host vehicle equipped with a flashing or rotary yellow beacon which can be seen in all directions and a truck mounted attenuator (TMA) or Trailer Truck Mounted Attenuator (TTMA) mounted on the rear. When the shadow vehicle is no longer needed, it shall be relocated behind a positive barrier or off the job site in a safe location.

~~Except as allowed for herein, TMA's and TTMA's utilized shall be listed on the Division Approved Products List (APL) for Impact Attenuators – MASH and shall meet the applicable requirements contained in Section 715.41.~~ TMA's and TTMA's utilized shall be listed on the Division Approved Products List (APL) for Impact Attenuators – MASH and shall meet the applicable requirements contained in Section 715.41.

The Contractor shall utilize the TMA or TTMA in accordance with the manufacturer's recommendations, shall be responsible for selecting an appropriate host vehicle configured in accordance with and meeting the manufacturer's recommendations, and shall be responsible for taking into consideration all factors such as expected post-impact roll ahead distance for their specific operation at each differing location. In all cases, the Gross Vehicle Weight

(GVW) of the host vehicle shall be within the range specified on the APL. This range is based on the parameters of the host vehicle weight(s) utilized during the MASH testing of the device.

~~For projects let on or prior to December 31, 2022, TMA's and TTMA's not listed on the Impact Attenuators – MASH APL but listed on the Impact Attenuators – NCHRP APL and manufactured on or prior to December 31, 2019 may be utilized.~~

Test Level 2 devices listed on ~~either~~ the MASH ~~or NCHRP~~ APL~~'s~~ may only be utilized on roadways with a normal posted speed limit of forty (40) MPH or less.

636.9-TRAFFIC CONTROL DEVICES:

DELETE THE CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING: NOTE: SUBSECTION IS NOT REDLINE COPY.

Signing, delineation, and channelization devices for work areas include, but may not be limited to, signs, portable sign stands, barricades, drums, cones, channelizer cones, delineators, and warning lights. Devices shall be installed in accordance with standards detailed in the manual "Manual on Temporary Traffic Control for Streets and Highways" (traffic control manual), latest version, published by the Division, or as shown on the plans. Devices shall be assembled and utilized in a manner that is consistent with the manufacturer's recommendations pertaining to parameters such as size, weight, placement, and material makeup of potential device attachments, location, weight, and material makeup of additional device ballast, etc. Specific device restrictions or requirements noted by the WVDOH on the Approved Products List on which the device is listed shall be followed. In addition to any other requirements contained herein, the following requirements for specific devices shall be met:

Drums	Section 715.9.3.1 and listed on Flexible Plastic Drums MASH APL
Channelizer Cones	Section 715.9.3.2 and listed on Channelizer Cones MASH APL
Cones	Section 715.9.3.3 and meet MASH Test Level 3 requirements Note 1
Type I and II Barricades	Section 715.9.3.4 and meet MASH Test Level 3 requirements Note 2
Type III Barricades	Section 715.9.3.4 and listed on Type III Barricades MASH APL
Surface Mounted Flexible Tubular Markers	Section 715.9.3.5 and listed on Flexible Plastic Delineators MASH APL
Soil Anchored Flexible Delineator Posts	Section 715.9.3.6 and listed on Flexible Plastic Delineators MASH APL
Guardrail Mounted Delineator Posts	Section 715.9.3.7 and listed on Flexible Plastic Delineators MASH APL
Type B-1 Delineators	Section 715.9.3.8 and listed on Flexible Plastic Delineators MASH APL
Portable Sign Stands	Section 715.9.6 and listed on Portable Sign Stands MASH APL

Portable Sign Stand Signs	Roll-up signs shall be manufactured consistent with those used in the MASH testing of the stand using elastomeric retroreflective sheeting and fiberglass ribs. The signs shall be manufactured using Type ASTM-VI material listed on the Division APL for Retroreflective Sign Sheeting, and matched components recommended by the sheeting manufacturer. Manufacturing methods shall be those recommended by the sheeting manufacturer. Signs shall be designed and fabricated in accordance with fabrication details provided in the Plans or the publication WVDOH Sign Fabrication Manual, as applicable. Rigid signs shall be manufactured in accordance with the requirements contained in Section 636.9.1 below.
Warning Lights	Section 715.9.5

Note 1: MASH Category 1 work zone device. No APL is maintained for this device type. As part of the Contractor's Materials Certification described in Section 636.2.1, the Contractor shall provide a copy of the manufacturer MASH self-certification letter for each make and model to be used on the project.

Note 2: MASH Category 2 work zone devices. No APL is maintained for these device types. As part of the Contractor's Materials Certification described in Section 636.2.1, the Contractor shall provide a copy of a statement from the manufacturer referencing the applicable FHWA MASH acceptance letters, or test reports from FHWA qualifying crash testing laboratories, which demonstrate MASH compliance for each make and model to be used on the project.

636.9.1-Static Support Mounted Signs: Unless otherwise specified or allowed for by the Plans or Engineer, static ground mounted sign assemblies which are subject to being impacted shall be installed on u-channel supports listed on the Division APL for U-channel Post. All static ground mounted assemblies shall be considered subject to impact except for specific assemblies agreed upon by the Engineer. The installation of the supports and signs shall be in accordance with the applicable portions of Section 657 and the WVDOH Standard Details Book Volume II, latest version in regard to support depth, use of breakaway devices as required, sign offset, and sign mounting height. Support size and quantity shall be sufficient to support the assembly when subjected to wind loading. Signs shall be attached to the supports in accordance with the Standard Details or shall otherwise be attached to the supports in a manner to remain secure during impacts. For larger assemblies, the maximum number of u-channel or back-to-back u-channel allowed for on the Standard Details may be increased. However, no more than three (3) u-channel or two (2) back-to-back u-channel may be installed within a seven (7) foot width. An approved breakaway device shall be used with u-channel when required on the Standard Details and in all cases with back-to-back u-channel. Breakaway devices shall be those approved by the Division for use with the specific brand of supports used. Provided the supports are driven to the depth specified in the Standard Details, the concrete foundation required for permanent back-to-back u-channel may be omitted if allowed for by the breakaway device manufacturer.

Variations to the requirements specified above such as number of supports within seven (7) feet, use of breakaway devices, and types of supports may be applied with the approval of the Engineer for assemblies, such as those shielded by barriers, agreed upon by the Engineer as not being subject to impacts. Requirements in the Standard Details for sign mounting height above the roadway shall be met.

Unless otherwise called for on the Plans or approved by the Engineer, signs shall be fabricated using 0.080-inch aluminum substrate, sheeting materials listed on the Division APL

for Retroreflective Sign Sheeting, and matched components recommended by the sheeting manufacturer. Aluminum composite material of a lighter weight than 0.080-inch aluminum and approved by the sheeting manufacturer may also be used. Manufacturing methods shall be those recommended by the sheeting manufacturer. All orange signs shall be fabricated using Type ASTM-XI sheeting. The sheeting used for all other signs shall be in accordance with Section 661.2.3. Substrate splicing utilized to fabricate signs from substrates smaller than the intended sign size shall only be allowed along edges of signs greater than five (5) feet in length, shall only be allowed once every five (5) feet, and shall be spliced in a manner to prevent separation during impacts. Signs shall be designed and fabricated in accordance with fabrication details provided in the Plans or the publication WVDOH Sign Fabrication Manual, as applicable.

The following static support mounted supplemental lead-in signs shall be provided and installed on projects meeting the requirements specified herein. The cost of furnishing, erecting, maintaining, and removal of these signs, including supports, shall be included in the units of Item 636011-* to be paid for each sign as indicated herein. At no time shall these signs be installed closer than 500 ft. from any other work area signing. The Contractor shall install such signs during the initial mobilization phase of the project and shall promptly remove each sign at the completion of the project for which the sign was erected.

636.9.1.1-Project Funding Source Signs: Project funding source signs shall be installed if the Total Contact Bid Amount is $750,000 or greater, or as otherwise noted on the plans. The quantity and locations of the signs shall be as directed by the Engineer. The Contractor shall be paid 180 units of Item 636011-* for each assembly installed.

These signs shall be fabricated in accordance with fabrication detail D40-1 of the publication WVDOH Sign Fabrication Manual. The funding agencies and the dollar amounts involved will be furnished to the Contractor by the Engineer.

636.9.1.2-Give ‘Em A Brake Signs: Give ‘Em A Brake (GEAB) signs shall be installed if the project is on an Interstate Highway, an APD (Appalachian Highway Corridor), a controlled access highway with posted speed limit of 40 Miles Per Hour (MPH) or greater, or if otherwise noted on the plans. The Contractor shall be paid 300 units of Item 636011-* for each assembly installed.

The signs shall be installed 500’-1500’ after the first lead-in work area sign unless the work zone is greater than one (1) mile, in length, in which case the GEAB sign shall be installed approximately ¼ mile in advance of the active work area. The signs shall be installed in both directions on the right side of the highway.

GEAB signs shall only be installed in active work areas where workers are present and visible to passing motorists. During periods of inactivity in the work area, the GEAB signs shall be covered or removed.

These signs shall be fabricated in accordance with fabrication detail G30-1 of the publication WVDOH Sign Fabrication Manual.

636.9.1.3-Fines Doubled Signs: Fines Doubled signs shall be installed if the Total Contact Bid Amount is $750,000 or greater, and the following criteria are met:

1. Four lane Interstate or expressway roadways with a posted speed limit of 55 MPH or greater

2. Two lane roadways with a posted speed limit of 50 MPH or greater and with an ADT at 3,000 or greater

These signs shall be fabricated in accordance with fabrication detail R20-2 of the publication WVDOH Sign Fabrication Manual. The Contractor shall be paid 300 units of Item 636011-* for each assembly installed.

These signs shall be installed approximately 500 ft. after the first maintenance of traffic sign installed for each project. The signs shall be installed in both directions on the right side of the highway.

636.12-TEMPORARY IMPACT ATTENUATING DEVICE:

DELETE THE 2ND AND 3RD PARAGRAPHS, AND REPLACE WITH THE FOLLOWING:

~~Except as allowed for herein, devices utilized~~ Devices utilized shall be listed in the applicable Class category on the Agency Impact Attenuators – MASH Approved Products List (APL). The type of Impact Attenuator utilized shall be a Test Level 2 or 3, Class 1 or 3 Impact Attenuator as defined in and meeting the requirements of Section 715.41, and as specified in the Plans. If space permits, a Test Level 3 device may be utilized where a Test Level 2 device is specified. Test Level 2 devices shall not be utilized on roadways with normal posted speed limits greater than forty (40) MPH. Only Class 1 devices noted on the APL as being approved for temporary work zone use may be used. All approved Class 3 devices are for temporary or emergency use only. In cases where a Class 3 device is specified, the array shall be properly designed for the obstacle to be shielded and shall be winterized in accordance with the manufacturer recommendations. Class 3 device arrays shall be designed for a minimum of forty-five (45) MPH for Test Level 2 and a minimum of sixty-five (65) MPH for Test Level 3.

~~For projects let on or prior to December 31, 2021, devices not listed on the Impact Attenuators – MASH APL but listed on the Impact Attenuators – NCHRP APL and manufactured on or prior to December 31, 2018, may be utilized. Appropriate Test Level Type II, III, VIII, or IX devices on the NCHRP APL noted as being approved for temporary work zone use may be utilized as a Class 1 device. Type V devices on the NCHRP APL appropriately designed for the specified Test Level may be utilized as a Class 3 device.~~

636.22-WARNING LIGHTS:

DELETE THIS SUBSECTION AND REPLACE WITH THE FOLLOWING:

~~**636.22-WARNING LIGHTS:**~~

~~Warning lights shall consist of the furnishing, installation and maintenance of a portable, lens directed, enclosed light. The warning lights shall be in accordance with the requirements of 715.9.5 of the Standard Specifications.~~

636.22-BLANK:

636.23-METHOD OF MEASUREMENT:

636.23.6-Traffic Control Devices:

REPLACE THE TRAFFIC CONTROL DEVICES RATE SCHEDULE TABLE WITH THE FOLLOWING:

TRAFFIC CONTROL DEVICES RATE SCHEDULE		
Device #	**Description**	**Value in Units Each Traffic Control Device**
1	Signs on portable mounts and barricades (Total sign area 16 sq. ft. (1.5 sq. meters) or greater)	170
2	Signs on portable mounts and barricades (Total sign area less than 16 sq. ft. (1.5 sq. meters))	80
3	Signs on permanent posts (Total sign area 16 sq. ft. (1.5 sq. meters) or greater)	180
4	Signs on permanent posts (Total sign area less than 16 sq. ft. (1.5 sq. meters))	90
5	Barricades-Type I	35
6	Barricades-Type II	60
7	Barricades-Type III	90
8	Drums	60
9	Cones	5
10	Vertical Panel or Ground Mounted Delineators	10
11	Barrier or Guardrail Mounted Delineators (Bid Incidental to Barrier or Guardrail)	0
12	Channelizer Cones	40
13	Oversize signs	300

~~1. Orange sign sheeting to be retroreflective fluorescent orange. WVDOH approved Type ASTM VI material shall be used for roll up signs. WVDOH approved Type ASTM IX or ASTM XI material shall be used for rigid signs on projects advertised prior to April 1, 2019. WVDOH approved Type ASTM XI material shall be used for rigid signs on projects advertised on or after April 1, 2019. All other signs shall be manufactured using WVDOH approved Type ASTM IV material unless fluorescent yellow or fluorescent yellow green material is specified, in which case WVDOH approved Type ASTM XI material shall be used.~~

~~2. Drum and Channelizer Cone sheeting to be six (6) inch WVDOH approved Type ASTM IV material.~~

~~3. Barricade and cone sheeting shall be WVDOH approved Type ASTM IV material.~~

~~4. Only those Drums, Channelizer Cones, Sheetings, Soil Anchored Flexible Delineator Posts, Surface Mounted Tubular Markers, Guardrail Mounted Flexible Delineators, and B-1 Delineators which have been field tested and approved by the Division will be permitted. A list of the approved suppliers and their code numbers may be obtained by contacting:~~

~~West Virginia Division of Highways~~
~~Materials Division~~
~~190 Dry Branch Dr.~~
~~Charleston, WV 25306~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 104
SCOPE OF WORK

104.13-FUNDING SOURCE IDENTIFICATION SIGNS:

DELETE THE ENTIRE 104.13 SUBSECTION.

~~**104.13 FUNDING SOURCE IDENTIFICATION SIGNS:**~~

~~**104.13.1 General:** Funding Source Identification Signs shall be furnished by the Contractor if the Total Contract Bid Amount of the construction exceeds $500,000 or otherwise noted on the plans, and shall be erected during mobilization of the project. The cost of furnishing, erecting, maintaining, and removal of these signs shall be incidental to the cost of construction of the project.~~

~~**104.13.2 Location:** Funding Source Identification Signs shall be located as directed by the Engineer. The Contractor shall promptly remove each sign at the completion of the project for which the sign was erected.~~

~~**104.13.3 Sign Content:** The content of each sign and the size of letters and the size of board shall be as required by the Engineer. The funding agencies and the dollar amounts involved will be furnished to the Contractor by the Engineer.~~

~~**104.13.4 Sign Construction:** The materials for Funding Source Identification Signs, such as for the sign panels, their supports, and for the legend and background, are to be of a type and method of fabrication that will be consistent with the conditions and estimated period of use. Signs shall have black letters for the legend on a white background. Reflective sheeting will be permitted, but not required. Mounting, transverse location, height, and similar features for Funding Source Identification Signs shall be consistent with practices used for the installation of other informational signs either on wooden or steel U-channel supports to comply with small sign support safety practices. The sign shall be mounted as directed by the Engineer.~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.9-WARNING DEVICES:

715.9.3-Channelizing Devices:

DELETE THE THIRD PARAGRAPH AND REPLACE WITH THE FOLLOWING:

With the exception of Guardrail Mounted Delineator Posts and Type B-1 Delineators, all devices described above shall be crashworthy when assembled, installed, and utilized in accordance with the device manufacturer's instructions. Crashworthy ~~shall be defined as meeting the crash testing performance requirements of National Cooperative Highway Research Program Report 350 (NCHRP-350) Test Levels I, II, and III for projects let on or prior to December 31, 2019, and~~ shall be defined as meeting the crash testing performance requirements of the 2016 edition AASHTO Manual for Assessing Safety Hardware (MASH-2016) at Test Levels I, II, and III ~~for projects let after December 31, 2019~~. ~~Devices which meet MASH-2016 and that have not been tested to NCHRP-350 may be used on projects with a letting date on or prior to December 31, 2019. Devices used for temporary traffic control applications that are manufactured on or prior to December 31, 2019 which meet NCHRP-350, but do not meet MASH-2016, may be used on projects with a letting date on or prior to December 31, 2022.~~

DELETE THE FIFTH PARAGRAPH WITH REPLACE WITH THE FOLLOWING:

The manufacturer shall be required to demonstrate the crashworthiness of a device as part of the submittal requesting consideration for including the device on the Division APL. Demonstration shall be by means of the manufacturer's ~~NCHRP-350 or~~ MASH-2016 self-certification letter for Drums, Channelizer Cones, Surface Mounted Flexible Tubular Markers, and Soil Anchored Flexible Delineator Posts. ~~Barricades eligible for use based on meeting NCHRP-350 shall be demonstrable to meet NCHRP-350 by means of a FHWA eligibility letter and are not required to be listed on the APL.~~ Barricades ~~required to meet MASH-2016 are required to be listed on the APL and~~ shall be demonstrable to meet MASH-2016 by means specified in official guidance issued by the WVDOH.

DELETE THE SIXTH PARAGRAPH.

The Contractor shall be required to demonstrate the crashworthiness of Cones to be utilized upon the Engineer's request. Demonstration shall be by means of the manufacturer's self-certification letter referencing the applicable crash testing standard.

715.9.3.4-Barricades:

DELETE BULLET v. AND REPLACE WITH THE FOLLOWING:

v. ~~Type III Barricades shall incorporate horizontal skids for stability.~~ Type III barricades shall be self-supporting and shall remain stable by incorporating a base design, such as horizontal skids or weighted components, in order to provide adequate wind resistance.

715.9.3.5-Surface Mounted Flexible Tubular Markers:

DELETE BULLET viii. AND REPLACE WITH THE FOLLOWING:

~~viii. Bases shall be colored black. In order to be approved for permanent applications, the bases shall be designed to allow mechanical fastening to the roadway using asphalt or concrete anchors. Appropriate anchors for the intended substrate shall be supplied by the manufacturer for permanent applications. SMFTM's whose bases are recommended by the manufacturer for installation using only non-mechanical means such as mixed, melted, or preformed adhesive shall be considered for temporary use approval only.~~

viii. SMFTM's shall utilize bases designed to be mounted to the top surface of the roadway and shall be colored black.

715.9.6-Portable Sign Stands:

DELETE REQUIREMENTS ii, iii, AND iv AND REPLACE WITH THE FOLLOWING:

ii. ~~Support legs shall have a retracted position for use on narrow shoulders and with smaller signs and an extended position for use on wider shoulders and with larger signs.~~ Stands shall be self-supporting and shall remain stable by incorporating a base design, such as an x-footprint leg design or weighted components, in order to provide adequate wind resistance.

iii. ~~With the support legs deployed, the side to side footprint taken up by the stand shall not exceed sixty (60) inches with the legs in the extended position and hall not exceed thirty-six (36) inches with the legs in retracted position.~~ When using thirty-six (36) inch diamond signs and forty-eight (48) inch diamond signs, the side to

side footprint taken up by the stand base shall not exceed thirty-six (36) inches and sixty (60) inches, respectively.

iv. ~~When using thirty-six (36) inch diamond signs with the legs in the retracted position, and forty-eight (48) inch diamond signs with the legs in the extended position, the stand shall remain in place, upright, and oriented correctly in wind gusts created by typical 55 MPH and 70 MPH speed limit traffic, respectively. Additional ballast in accordance with the specifications herein is permissible. The stand's mechanism of wind spilling shall not result in the sign being oriented such that the sign message is illegible to drivers for excessive durations.~~ When using thirty-six (36) inch diamond signs and forty-eight (48) inch diamond signs, the stand shall remain in place, upright, and oriented correctly in wind gusts created by typical 55 MPH and 70 MPH speed limit traffic, respectively. The stand's mechanism of wind spilling shall not result in the sign being oriented such that the sign message is illegible to drivers for excessive durations.

DELETE THE SEVENTH PARAGRAPH AND REPLACE WITH THE FOLLOWING:

"Crashworthy" shall be defined as meeting the crash testing performance requirements of the 2016 edition AASHTO Manual for Assessing Safety Hardware (MASH) at Test Levels 1, 2, and 3~~ for projects let after December 31, 2019~~. ~~Stands manufactured on or prior to December 31, 2019 that do not meet MASH may be used on projects with a letting date on or prior to December 31, 2022, provided the stands meet the crash testing performance requirements of National Cooperative Highway Research Program Report 350 (NCHRP 350) Test Levels 1, 2, and 3.~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 658
OVERHEAD SIGN STRUCTURES

658.5-ERECTION:

658.5.6-Structure Installation:

658.5.6.3-Installation Procedure:

DELETE THE ENTIRE CONTENTS AND REPLACE THE FOLLOWING:

658.5.6.3-Installation Procedure: The following steps shall be followed during the erection procedure:

1. Clean the anchor bolts with a wire brush or equivalent and lubricate the anchor bolts as described herein if this has not already been done.
2. Place and level the foundation leveling nuts with washers on top. Initial placement of the leveling nuts shall be no more than ¼-inch above the top of the foundation.
3. Bring the support leg(s) into position for placement. Insure anchor bolts and the bolt holes in base plate are properly aligned. No cold working of the anchor bolts shall be allowed. No cutting or reaming of holes will be allowed without prior approval from the Traffic Engineering Division.
4. Place the support leg(s). The Contractor shall take due care to avoid damaging the anchor bolt threads during this process. If the structure has multiple support legs, one support leg shall be placed and fully tightened into place at a time.
5. With the support leg as plumb as possible, adjust the leveling nuts as needed. The gap between the top of concrete and the bottom of each leveling nut shall not exceed the diameter of the anchor bolt after this process is completed.
6. ~~Place top washers and nuts. Snug tighten the top nuts, followed by the leveling nuts. Each set of nuts shall be snug tightened in a star pattern. Snug tightness is considered to be the tightness which exists due to the full effort of a man using a spud wrench with the appropriate length handle for the bolt being tightened. The handle length used for bolts ¾ inch to 1 ¼ inches in diameter shall be 23 inches. The handle length used for bolts 1 ½ inches to 2 ¼ inches in diameter shall be 36 inches.~~ Fully tighten the anchor bolt top nuts in accordance with Materials Procedure (MP) **XXXX**. The tightening process shall be documented and transmitted to the Traffic Engineering Division in

accordance with MP XXXX. When the snug tightening portion of MP **XXXX** is completed, the Contractor shall verify that all nuts and washers were brought into firm contact with the base plate. Beveled washers may be necessary under the leveling or top nut if any face of the base plate has a slope greater than 1:20 and/or any nut could not be brought into firm contact. If it is determined that beveled washers are required, the support leg shall be disassembled from the anchor bolts and the erection procedure shall be restarted using the beveled washers. Beveled washers shall be manufactured of the same material as the base plate and shall be galvanized. Beveled washers shall be square with the length of each side being equal to or greater than the diameter of the normal washers. The minimum thickness of the beveled washers shall be the thickness of the normal washers

~~7. Fully tighten the anchor bolts following the procedure described in Section 658.5.6.3.1.~~

~~8.~~7. Release any load by crane or other erection device. The anchor bolt nuts must be properly tightened before removal of the crane. If problems exist such as the anchor connections are loose after release, then repeat the nut tightening procedure.

~~9.~~8. Lift the structure arms or span into place. The Contractor shall be responsible for determining and selecting appropriate lift points in order to not overstress the structural components or attachments during lifting.

~~10.~~9. Once components that are attached using structural connection bolts are lifted into place and lubrication is applied to the hardware components as required, the bolts shall be snug tightened and then fully tightened immediately. The snug tightening procedure used shall be the same as described for the anchor bolts ~~above under item number 6~~ in MP **XXXX**. The procedure for fully tightening the bolts is described in Section ~~658.5.6.3.2~~ 658.5.6.3.1. Once span structures are lifted into place and proper alignment is verified, they shall be secured to the support legs by installing and tightening the u-bolts immediately.

~~11.~~10. Check structure. If problems exist, such as loose arm connections or showing gaps, the load must be removed from the area in question and steps repeated as necessary. If this requires loosening structural connection bolts that have already been fully tightened, the bolts shall be replaced.

~~12.~~11. If not installed prior to lifting the arms or chords into place (required for box truss spans), all signs to be attached to the structure arms or chords shall be installed immediately after the attachment hardware for the arms or chords are fully tightened.

~~**658.5.6.3.1 Anchor Bolt Tightening:** After snug tightening has been accomplished, the following procedure shall be followed for fully tightening anchor bolts:~~

~~1. Verify that all nuts and washers were brought into firm contact with the base plate. Beveled washers may be necessary under the leveling or top nut if any face of the base plate has a slope greater than 1:20 and/or any nut could not be brought into firm contact. If it is determined that beveled washers are required, the support leg shall be disassembled from the anchor bolts and the erection procedure shall be restarted as described in Section 658.5.6.3 using the beveled~~

washers. Beveled washers shall be manufactured of the same material as the base plate and shall be galvanized. Beveled washers shall be square with the length of each side being equal to or greater than the diameter of the normal washers. The minimum thickness of the beveled washers shall be the thickness of the normal washers.

2. Before tightening, at each bolt location the reference position of the top nut in the snug-tight condition shall be marked with a suitable marking on one flat with a corresponding reference mark on the base plate.
3. Top nuts shall be turned in increments and in a star pattern over at least two full tightening cycles, meaning the rotation applied to each nut during each cycle shall be approximately half the amount described herein. Nut rotation shall be ⅓ of a turn for bolts 1-½-inches in diameter or less and shall be 1/6 of a turn for bolts greater than 1-½ inches in diameter. The amount of torque required to fully tighten each nut shall be recorded for use in steps 4 and 5. After tightening, the nut rotation shall be verified. The wrench used shall be a hydraulic torque wrench with sufficient capacity for the bolts to be tightened, and with the capability of loosening. Prior to tightening any fasteners, the Contractor shall provide the Engineer with a copy of calibration certificates for the hydraulic wrench. Separate calibration certificates are required for each wrench and for the gauge associated with each power pack to be used on the project. The date of the calibrations shall be one year or less prior to the advertising date of the Contract. The certificate provided shall be from a calibration lab that is International Organization for Standardization (ISO) 17025 accredited, with the certificate indicating as such. Both the certificate and wrench or gauge shall display matching serial numbers.
4. The same hydraulic torque wrench and power pack combination which was used to fully tighten the anchor bolts shall be used to verify that a torque at least equal to the torque value given by the following equation is required to additionally tighten the leveling nuts and the top nuts. If the required torque is less, this should be interpreted to indicate that the threads have stripped and should be reported to the Traffic Engineering Division.

$$T_v = 0.12\,(D_b)\,F_i$$

Where:

T_v = verification torque (inch-kips)
D_b = nominal body diameter of the anchor bolt (inches)
Fi = 60% of the anchor bolt minimum tensile strength (kips) (= 45 ksi for ASTM F1554 Grade 55)

Multiply T_v by 83.3 to calculate T_v in ft-lbs

5. After at least 48 hours, the same hydraulic torque wrench and power pack combination which was used to fully tighten the anchor bolts shall be used to verify that a torque at least equal to 1.10 T_v is required to additionally tighten the leveling nuts and the top nuts. If the required torque is less, this should be interpreted to indicate that the threads have stripped and should be reported to the Traffic Engineering Division.

~~658.5.6.3.2~~ 658.5.6.3.1-**Structural Connection Bolt Tightening:** After snug tightening has been accomplished, apply the appropriate rotation to the turning elements in the same sequence as snug tightening. Rotation shall be in accordance with Table 615.5.6.3 B. Full tightening of each bolt shall be accomplished in approximately 10- seconds using a hydraulic torque wrench meeting the requirements specified herein, or impact wrenches of adequate capacity.

March 14, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING.

SECTION 665
WATER WELL SURVEY

665.1-DESCRIPTION:

This work shall consist of a preconstruction water well survey as designated on the Plans.

665.2-MATERIALS

665.2.1-Water Well Survey: The water well survey is intended to document preconstruction conditions. The Contractor, or subcontractor, shall be a WVDEP certified monitoring well driller. At a minimum, the representative shall complete the WVDEP Inspector Check-Off List for Monitoring Wells. Any additional remarks relating to the casing, screen and well head are to be noted on the report.

In addition to providing a WVDEP Inspector Check-Off List for Monitoring Wells, the Contractor shall document the water quality of the existing well by collecting water samples and performing chemical and bacterial testing at a WVDEP approved laboratory. The chemical testing shall at a minimum, include sulfates, iron, chlorides, hardness, dissolved solids, conductivity, pH and turbidity. Bacterial testing is to include total coliform. The chemical and bacterial testing shall be conducted at a WVDEP approved laboratory, at no additional cost to the Division.

The Contractor shall provide a copy of the Inspector Check-Off List and testing reports to the Engineer. In addition, the Contractor shall provide copies of all reports to the well owner, if requested, and a copy of the transmittal letter providing these reports to the Engineer.

Unless otherwise noted, The Division will obtain right-of-entry. Contractor shall enter property with the aid of Law Enforcement.

665.3METHOD OF MEASUREMENT:

The water well survey, field and laboratory work will be measured and paid for per each well surveyed and tested.

665.4-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 prices and payment shall be full compensation for furnishing all the materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies and incidentals necessary to complete the work.

665.5-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
665004-001	Water Well Survey	Each

March 21, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 663
PAVEMENT MARKINGS AND RUMBLE STRIPS

663.2-MATERIALS:

DELETE THE LAST ITEM IN TABLE AND REPLACE WITH THE FOLLOWING:

MATERIAL	SUBSECTION
White or Yellow Fast-Dry Traffic Paint, Types II and IX	711.41

663.5-APPLICATION:

663.5.2-Temporary and Permanent White or Yellow Traffic Zone Paint:

DELETE THE FIRST SENTENCE OF PARAGRAPH EIGHT AND REPLACE WITH THE FOLLOWING:

Permanent Traffic Paint shall be Type II or Type IX, White or Yellow Fast-Dry Traffic Paint as ~~described in Materials sections 711.41, unless otherwise~~ specified in the Plans.

663.5.2.2-Contractor's Warranty:

DELETE THE TITLE AND CONTENTS OF THE SUBSECTION AND REPLACE WITH THE FOLLOWING: NOTE: SUBSECTION IS NOT REDLINE COPY.

663.5.2.2-Performance and Warranty Requirements:

663.5.2.2.1-Temporary White or Yellow Traffic Paint: Temporary white or yellow traffic paint shall perform as and for the duration specified in Section 711.40. The performance of the markings in relation to the performance requirements shall be assessed and determined as specified in Section 711.40. Such markings determined by the Engineer to be in non-compliance with Section 711.40 shall be replaced within twenty (20) Calendar Days.

663.5.2.2.2-White or Yellow Fast-Dry Traffic Paint, Types II and IX: Except as specified herein, the Contractor shall warrant white or yellow fast-dry traffic paint, Types II and IX, to perform as and for the duration specified in Section 711.41. The performance of the markings in relation to the performance requirements shall be assessed and determined as specified in Section 711.41.

Type II or Type IX markings placed prior to April 15th, or on or after November 1st, shall be required to meet the performance requirements of Section 711.41 at the time of application only.

During the warranty periods, if any markings greater than 1000 feet are found to be deficient for any reason, the Contractor will be given notification stating the locations and the type of deficiency. These notifications will be given at any time within the specified warranty periods for the markings. The Contractor shall completely replace the deficient markings, as directed by the Engineer, within twenty (20) calendar days of the written notification. Retroreflectivity and color may be checked after re-application of the pavement marking to ensure that segment meets the performance requirements of Section 711.41.

If the Contractor does not complete the replacement of all of the deficient pavement markings by the end of the twenty (20) calendar day replacement period, and the Contract has not been finalized, the Contractor shall be subject to liquidated damages as described within Section 108.7 until replacement is completed. These liquidated damages shall not stop during the winter shut-down period. No direct payment shall be made for the replacement of any deficient pavement marking during the warranty period as such work shall be considered as incidental to the work as paid for by the various pavement marking items in the Contract.

663.5.5-Type V Preformed Intersection Traffic Markings:

663.5.5.1-Contractor's Warranty:

DELETE THE TITLE AND THE FIRST AND SECOND PARAGRAPHS AND REPLACE WITH THE FOLLOWING: NOTE: SUBSECTION IS NOT REDLINE COPY.

663.5.5.1-Performance and Warranty Requirements: If the material has been identified by the Division as having failed the skid resistance (when applicable), adherence, road presence, color, and/or retroreflectivity requirements described in Materials Section 715.40.2 before finalization of the Contract, the material shall be corrected by the Contractor in a manner acceptable to the Division and in accordance with the Manufacturer's recommendations at no additional cost to the Division if the failure is determined by the WVDOH to be caused by improper installation or defects in the manufacturer's materials. If the material has been identified as having failed after finalization of the Contract, but less than one (1) year from the date of application, the material shall be corrected by the Contractor in accordance with the requirements above if the failure is determined by the WVDOH to be caused by improper installation.

DELETE THE SECOND SENTENCE OF THE THIRD PARAGRAPH AND REPLACE WITH THE FOLLOWING:

In the event that the Contractor fails to meet this time requirement~~,~~ and the Contract is not finalized, the Contractor shall be subject to liquidated damages ~~will be charged for each Calendar Day in the amount of $120 per day~~ as described within Section 108.7 until replacement is completed.

663.6-METHOD OF MEASUREMENT:

DELETE THE SECOND SENTENCE OF THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

~~Length m~~Measurement shall be based on the actual length footage or mileage of the line placed and shall exclude gaps. The individual lines of centerlines along two-way, two-lane roadways shall be individually measured.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 711
PAINTS, COATINGS, OILS, AND INKS

711.40-TEMPORARY WHITE OR YELLOW TRAFFIC ZONE PAINT:

711.40.1-Color and Retroreflectivity Requirements:

UNDER "RETROREFLECTIVITY" DELETE THE SECOND SENTENCE OF THE SECOUND PARAGRAPH AND REPLACE THE FOLLOWING:

Readings shall be taken with a Delta Light and Optics LTL-X or later Delta model handheld reflectometer.

711.40.2-MAP-21 Section 1504 Requirements:

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

711.40.2-Reflective Element Arsenic and Lead: Any reflective elements containing glass used in the markings shall contain no more than 200 parts per million of arsenic or lead, as determined in accordance with Environmental Protection Agency testing methods 3052, 6010B, or 6010C.

Prior to application of the markings, the Contractor shall provide certifications of compliance for all glass containing reflective elements to be used. These certifications shall be from each element supplier and shall identify the reflective element products being supplied by product name or number. Each supplier's certification shall be accompanied by certification from an independent testing laboratory. The lab certification shall certify that a representative sample of the supplier's products has been tested, and that the products meet the requirements previously specified. The lab certification shall provide clear indication that the products tested include the products specified by the suppliers in their certification letters and shall indicate the dates that the testing was performed. The date of testing for each product shall be one (1) year or less prior to the letting date of the Contract. The representative samples tested are not required to be from the same batch or lot number assigned to the beads used on the project.

711.41-WHITE OR YELLOW FAST-DRY TRAFFIC PAINT (TYPE II):

DELETE THE TITLE AND REPLACE WITH THE FOLLOWING:

711.41-WHITE OR YELLOW FAST-DRY TRAFFIC PAINT (TYPES II AND IX):

711.41.1-General:

DELETER THE FIRST SENTENCE OF THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Type II and Type IX pavement marking materials shall be capable of providing one year and two years of continuous performance, respectively.

DELETE THE SECOND SENTENCE OF THE SIXTH PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Section 663 specifies that the Contractor shall be required to apply an appropriate Type II or Type IX material at ambient air temperatures as low as thirty-five (35) degrees Fahrenheit.

DELETE THE FIRST SENTENCE OF THE SEVENTH PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The warranty and performance criteria of this specification shall apply to Type II and Type IX markings placed on or after April 15th and prior to November 1st.

711.41.2-Color and Retroreflectivity Requirements:

ADD THE FOLLOWING AFTER THE FIRST PARAGRAPH:

In addition to testing with handheld equipment as described herein, markings are also subject to mobile testing by the Division using equipment that has been evaluated and determined to be acceptable for such use by the Division. A 15% tolerance with the stated minimum required retroreflectivity values herein shall be allowed when tested with mobile equipment.

DELETE THE SECOND SENTENCE OF THE THIRD PARAGRAPH IN THE “COLOR SECTION” AND REPLACE WITH THE FOLLOWING:

The colorimeter utilized by the Engineer shall be a make and model determined to be acceptable by the Division. Colorimeters utilized by the Contractor for verification shall be subject to approval by the Division, shall be properly field calibrated at the time of use, and shall have been properly lab calibrated one year or less prior to the date of use. Delta Light and Optics LTL-Y or later Delta models shall be considered approved by the Division.

DELETE THE "RETROREFLECTIVITY SECTION" AND REPLACE WITH THE FOLLOWING:

RETROREFLECTIVITY: Markings installed on or after April 15th and prior to November 1st shall be subject to the following minimum retroreflectivity requirements for the duration specified:

Material	White Retroreflectivity	Yellow Retroreflectivity	Duration
Type II	200 mcd/lx/m2	150 mcd/lx/m2	Through October 31st of the same year as application
Type IX	Need Values	Need Values	Through October 31st of the year following application

Thirty Meter (30-meter) geometry retroreflectivity measurement equipment shall be used to verify marking retroreflectivity levels. The retroreflectometer utilized by the Engineer shall be a make and model determined to be acceptable by the Division. Retroreflectometers utilized by the Contractor for verification shall be subject to approval by the Division, shall be properly field calibrated at the time of use, and shall have been properly lab calibrated one year or less prior to the date of use. Delta Light and Optics LTL-X or later Delta models shall be considered approved by the Division.

711.41.3-Sampling and Testing Procedures for Performance Samples:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

In addition to mobile equipment testing, the Division may utilize the following sampling method using handheld equipment in order to determine the conformance of the markings with the requirements herein:

711.41.4-MAP-21 Section 1504 Requirements:

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

711.41.4-Reflective Element Arsenic and Lead: Any reflective elements containing glass used in the markings shall contain no more than 200 parts per million of arsenic or lead, as determined in accordance with Environmental Protection Agency testing methods 3052, 6010B, or 6010C.

Prior to application of the markings, the Contractor shall provide certifications of compliance for all glass containing reflective elements to be used. These certifications shall be from each element supplier and shall identify the reflective element products being supplied by product name or number. Each supplier's certification shall be accompanied by certification

from an independent testing laboratory. The lab certification shall certify that a representative sample of the supplier's products has been tested, and that the products meet the requirements previously specified. The lab certification shall provide clear indication that the products tested include the products specified by the suppliers in their certification letters and shall indicate the dates that the testing was performed. The date of testing for each product shall be one (1) year or less prior to the letting date of the Contract. The representative samples tested are not required to be from the same batch or lot number assigned to the beads used on the project.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 715
MISCELLANEOUS MATERIALS

715.40-PAVEMENT MARKING MATERIAL:

715.40.2-Preformed Intersection Traffic Markings (Type V Material):

715.40.2.2-Adherence, Retroreflectivity, Color, Road Presence, and Skid Resistance Warranty Requirements:

UNDER "RETROREFLECTIVITY SECTION", DELETE THE FIRST AND SECOND SENTENCES OF THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Retroreflectivity readings shall be taken with a Delta Light and Optics LTL-X or later Delta model handheld reflectometer.

UNDER THE "COLOR SECTION", DELETE THE FIRST SENTENCE OF THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The colormeter used shall be a Delta Light and Optics LTL-Y or later Delta model.

715.40.3-Interim Pavement Markings (Type VIIA Interim Pavement Marking Tape):

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

This specification describes an interim pavement marking tape, to be placed immediately after paving operations are completed, and prior to the opening of the roadway to traffic, as described in Section 663.5. The material shall be designed to be inlaid and used in place of centerlines and lane lines until temporary edge lines, centerlines, and lane lines are placed as described in Section 636.8, within the time period specified in Section 663.5.

715.40.3.1.1-Requirements:

UNDER PARAGRAPH "ii. Color" AFTER THE TABLE, DELETE THE SECOND SENTENCE AND REPLACE WITH THE FOLLOWING:

The colormeter used shall be a Delta Light and Optics LTL-Y or later Delta model.

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

UNDER PARAGRAPH "ii. COLOR" AFTER THE TABLE, DELETE THE PARAGRAPH AND REPLACE WITH THE WITH THE FOLLOWING:

The colormeter used shall be a Delta Light and Optics LTL-Y or later Delta model.

UNDER PARAGRAPH "vii. RETROREFLECTIVITY" DELETE THE SECOND SENTENCE AND REPLACE WITH THE FOLLOWING:

Retroreflectivity readings shall be taken with a Delta Light and Optics LTL-X or later Delta model handheld reflectometer.

715.40.4.3-Temporary Pavement Markings (Type VIIC):
715.40.4.3.1-Requirements:

UNDER THE PARAGRAPH "ii. COLOR" DELETE THE FIRST SENTENCE OF THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The colormeter used shall be a Delta Light and Optics LTL-Y or later Delta model.

UNDER THE PARAGRAPH "x. RETROREFLECTIVITY" DELETE THE FORTH SENTENCE AND REPLACE WITH THE FOLLOWING:

Retroreflectivity readings shall be taken with a Delta Light and Optics LTL-X or later Delta model handheld reflectometer.

February 22, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 704
STONE AND CRUSHED AGGREGATE

704.4-DUMPED ROCK GUTTER:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The material for dumped rock gutter shall be ~~rock~~ limestone, sandstone~~,~~ or other inorganic material that is not classified as shale or shale-like. This material shall not be combined with ~~containing a combined total of not~~ more than 15 percent of any other suitable material, as determined by visual inspection. Other suitable material shall be determined by the Engineer.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 709
METALS

709.1-STEEL BARS FOR CONCRETE REINFORCEMENT:

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

All plain and deformed bar reinforcement~~, whether deformed or plain,~~ shall meet the requirements of AASHTO M31~~ or AASHTO MP18 and be NTPEP certified where applicable~~. The manufacturer shall also be an active member in the National Transportation Product Evaluation Program (NTPEP) as well as conform to the requirements of MP 709.01.55. ~~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.~~

ADD THE FOLLOWING SUBSECTIONS:

709.1.3-Galvanized Coated Bars for Concrete Reinforcement: For galvanized coated reinforcing steel, the uncoated material shall conform to Section 709.1, and the galvanized

coating shall meet ASTM A767 for the immersion process or ASTM A1094 for the continuous hot dip galvanizing process.

709.1.4-Epoxy Coated Reinforcing Steel: Shall meet the requirements of Section 709.1, MP 709.01.51, and 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 total damaged surface area (prior to repair with patching material), shall not exceed 2 % in any given 1-foot section of coated reinforcement. The total bar surface area covered by patching material shall not exceed 5 % in any given 1-foot section of coated reinforcement. This limit on damaged and repaired area shall not include sheared or cut ends. All field handling and patching requirements shall conform to ASTM D3963.

December 16, 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 SUBSECTION:

715.14.2-Approval for Bearing Pads Without Shims: After January 1, 2024 bearing pads that do not include shims or internal stiffeners will only be accepted using NTPEP test results and a certificate of compliance from NTPEP.

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

March 14, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING SECTION:

SECTION 221
ROCKFALL MITIGATION

221.1-DESCRIPTION:

This work shall consist of constructing various rockfall mitigation devices in accordance with these Specifications and in reasonably close conformity to the lines, grades, dimensions, and locations shown on the Plans or established by the Engineer.

The types of rockfall mitigation are as follows:

1. Rock Slope Scaling
2. Pinned Wire Mesh
3. Slope Drape
4. Rockfall Attenuator Barrier
5. Attenuator Barrier Drape
6. Rockfall Barrier

221.2-MATERIALS:

The Contractor shall furnish materials that are new and without defects; all defective materials shall be removed from the job site at no additional cost to the Department.

Materials shall be stored to assure their preservation of their quality and work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work.

221.3-SUBMITALS:

The Contractor shall deliver all submittals required by this specification to the Engineer no later than thirty (30) calendar days prior to constructing any rock mitigation device. No rock mitigation device shall be constructed prior to the Engineer's review and acceptance of all submittals

221.3.1-Qualifications and Experience: The Contractor shall submit a project reference list verifying the successful completion of at least three (3) rockfall mitigation projects during

the last three (3) years, for which the Contractor, or Contractor's key personnel who will be on-site, have installed rockfall mitigation devices like those shown in the plans, similar quantities, and under similar subsurface conditions. These projects shall include the use of high-angle industrial rope or platform access. A brief description of each project with the owner's representatives name and current contact information who can verify the participation in those projects shall be included.

A West Virginia Registered Professional Engineer employed by the Contractor shall supervise the work and have experience in rockfall barrier construction on at least three (3) completed projects over the past three (3) years. The on-site supervisor, technicians, and equipment operators shall have experience in rockfall barriers on at least three (3) projects over the past three (3) years, including projects requiring use of high-angle industrial rope and platform access. The Contractor shall not use consultants or manufacturer's representatives to satisfy the requirements of this section.

221.3.2-Work Plan: The Contractor shall submit a work plan including the following information:

(a) Method of Operation.
(b) Proposed construction sequence and schedule.
(c) Type and quantity of equipment and tools to be utilized in the work.
(d) Number crews required and estimated number of hours for each operation.
(e) Removal and disposal plan for materials.
(f) Type of shielding system designed to protect personnel, equipment and adjacent facilities from injury or damage that may be caused by activities. The system shall be designed with sufficient height and structural integrity to withstand the impacts and to prevent loose rock and debris from leaving the roadway and impacting adjacent property.

221.3.3-Construction Preconstruction Meetings: The Contractor and Engineer shall meet before beginning any rockfall mitigation item to clarify construction requirements, coordinate schedules and activities, and identify responsibilities of the Contractor and the Subcontractors. The Subcontractor shall attend the meeting if performing any work.

218.4-ROCK SLOPE SCALING:

Prior to start of any scaling activities, the Contractor and Engineer shall jointly inspect the site to observe and document the pre-construction condition of the site, existing structures and facilities. During construction, the Contractor shall observe the conditions in the vicinity of the rock slope areas daily for signs of ground movement in the vicinity of the scaling operation(s). The Contractor shall immediately notify the Department if signs of movement, such as: new cracks in structures, increased size of old cracks or separation of joints in structures, foundations, streets or paved and unpaved surfaces are observed. If the Department determines that the movements exceed those anticipated for typical rock slope scaling and require corrective actions, the Contractor shall take corrective actions necessary to stop the movement and perform repairs. When due to the Contractor's methods or operations, or failure to follow the specified/approved construction sequence, as determined by the Department, the cost of providing corrective actions shall be borne by the Contractor.

This Work shall consist of scaling rock slopes by manual or machine scaling methods requiring high-angle industrial rope access/platform, or by mechanical percussion as specified

herein. The work shall be performed at locations specified on the Plans, to the specified degree, and properly disposal of scaled material(s). The work includes removal and disposing of vegetation (including trees and brush) and excavation of soil or weathered rock, when required.

The work shall include removing and disposal of loose and/or potentially unstable rock from the rock slope, rock resting on any soil slope above the rock face, and existing rockfall material in roadway ditches and slope catchment areas by hand and/or hand tools, and mechanical methods such as metal bars or light equipment such as hydraulic splitters used to scrape the slope face.

The work shall also include removing overhangs of loose and/or potentially unstable rock from the rock slope, rock boulders resting on any soil slope above the rock face and other potentially dangerous conditions; which may require additional equipment such as air bags or pneumatic jacks in order to removal the material.

Scaling of loose or potentially unstable rock shall be accomplished by manual or mechanics scaling methods and may include mechanical percussion equipment. The rock slope locations delineated on the Plans shall be thoroughly scaled and trimmed to the satisfaction to assure that the desired rock face is obtained. No loose or potentially unstable rock shall be left on the rock face or the soil slope above the rock face. No vegetation shall be left on the rock face. No overhangs or launching pads shall be left on the rock face. Care shall be taken to minimize damage to the surface of any roadways, utilities, guiderail, drainage structures, signs, or other facilities by equipment or falling rock.

Rock slope scaling shall be completed prior to any slope stabilization such as rock bolting, installation of rockfall barriers or rockfall drapes, or other protection systems.

The rock scaling work shall be performed as follows, unless otherwise noted in approved work plan:

1. Begin rock slope scaling at the top of the slope and proceed downward toward the roadway, removing all loose rock blocks as the work progresses.
2. Remove the loose rocks and boulders, large blocks of rock protruding out of the slope and overhangs to create a uniform surface for placement of the wire mesh as directed by the Engineer. Prepare a finished rock slope surface that is suitable for placing the wire mesh system by using hand tools, small pneumatic and hydraulic tools, mechanical methods, chemical methods (non-explosive demolition agent), or other approved methods.
3. Do not excavate material that will disturb the intact rock comprising the toe of slope.
4. Do not remove pieces of rock that will result in undercutting of overlaying material.
5. Repair excessive undercutting or over hanging rock as shown and as directed by the Contractor's rockfall engineer.
6. Remove stumps as directed by the Engineer during scaling.
7. Provide telecommunication inspection equipment to allow the Engineer to adequately analyze the slope conditions. The Engineer will evaluate the final rock face for stability prior to accepting the completed work. Perform scaling only in the presence of the Engineer.
8. Prevent damage to the adjacent roadway and related items and repair or replace any damaged pavement, guiderail, or other roadway appurtenances at the Contractor's expense.
9. Blasting is prohibited.
10. Construction

221.5-PINNED WIRE MESH:

This work is for furnishing and installing pinned wire mesh. The Contractor shall furnish all labor, materials, equipment and incidentals required for completing the work. The Contractor shall select the method and equipment to meet the performance requirements specified herein.

221.5.1-Materials: Materials shall meet the following corrosion protection requirements:

Mesh, Ropes, and Hardware. Facing hardware to include high-tensile steel wire mesh facing, hex nuts, spike plates, boundary ropes, wire rope anchors, and compression claws. Galvanize in accordance with manufacturer specifications. Materials shall be powder coated to match US Government Standard Color 595C 26255.

Anchors. Epoxy Coating meeting requirements of AASHTO M284/ASTM A775. Minimum 12 Mils electrostatically applied. Bend test requirements are waived.

High tensile steel wire mesh reinforcement system with a minimum of 150 kN/m tensile strength to be designed by Contractor utilizing steel wire mesh facing, spike plates, boundary ropes, wire rope anchors, compression claws and other facing hardware meeting the following minimum requirements:

1. Spike Plates. Diamond-shaped:
   Length (minimum): 350 mm (13.77")
   Width (minimum): 170 mm (6.69")
   Thickness (minimum): 10 mm (0.39")
2. Boundary Ropes.
   Heavy Type: Rope, steel wire:
   Diameter = 12 mm (0.47”) minimum
   Breaking Force: ZR = 84 kN (9.44 tons) minimum
3. Wire Rope Anchors: Galvanized 2-stranded with double steel tube in loop section.
   Diameter = 19 mm (0.75”) minimum
   Breaking Force: ZR = 235 kN (26.46 tons) minimum
4. Seam Rope for Wire Mesh Overlaps: Galvanized wire.
   Diameter = 8 mm (0.3125”) minimum
   Breaking Force = 41 kN (4.6 tons) minimum

221.5.2-Work Plan - Wire Mesh, Rock Anchor Bolts, and Wire Rope Anchors: Installation of the wire mesh, rock anchor bolts and wire rope anchors shall be included on Work Plan, as noted in 221.3.2. Include the following minimum information for the plan:

(a) General installation procedures including, but not limited to, inspection reports and survey plan.
(b) Description and purpose of essential equipment to be used including catalog cuts, brochures and other literature describing the equipment to be used for drilling, grouting, handling, and installing wire mesh, rock anchor bolts and wire rope anchors.
(c) Procedures and sequences for wire mesh and wire rope anchor installation including any grout mix design.
(d) Procedures for wire rope anchor stressing and testing procedures detailing lengths, forces and elongation including test reports.

221.5.3-Installation. Install mesh at the locations identified on the drawings or as directed by the Engineer. Fasten ends of mesh with wire rope anchors in accordance with the Contractor's design. Install the Pinned Wire Mesh in vertical strips to the limits as shown on the Contract drawings or as directed by the Engineer. Install all wire mesh in accordance with the slope treatment details and as directed by the Engineer. Install all fasteners, connectors, ropes and associated hardware in accordance with the manufacturer's recommendations.

Configuration and load testing of wire rope anchors to support the ends of the wire mesh will be in accordance with the Contractor's design.

Anchor the bottom of the wire mesh to prevent accumulated rockfall from impacting traffic barrier.

221.5.4-Wire Rope Anchor Testing: Perform proof testing on a minimum of five (5) percent of wire rope anchors at each cut location as selected by the Contractor and approved by the Engineer.

221.6-SLOPE DRAPE:

This work consists of furnishing and constructing a slope drape, consisting of a wire mesh either with or without a cable net, draped over a rock slope to restrain and control falling rocks. The slope drape is suspended from anchors and wire ropes along the crest of a slope.

The Contractor shall select the drilling method and equipment; drilled hole diameters, spacings and depths; and anchor type and grouting procedures to obtain the required results. The Contractor shall furnish all labor, materials, equipment, and incidentals required for completing the work.

221.6.1-Materials: Materials shall conform to the following requirments:

Steel components, including anchors and clamps	ASTM A36
Bolts, Nuts, and Washers	ASTM F3125, Grade A325

Wire rope, cable net, if required, and support ropes that are galvanized in conformance with Federal Specification RR-W-410F. For all other steel components that are not manufactured from zinc-coated wire, galvanize according to ASTM B 695, Class 50.

Materials shall be labeled by the manufacturer so that they can be identified on the manufacturer's working drawings.

Wire Mesh. Furnish a double-twist, 8 × 10 hexagonal type wire mesh that is manufactured from either zinc-coated steel wire conforming to ASTM A641, Class 3 coating, soft temper, or from Zn-5Al-MM-coated steel wire conforming to ASTM A856, Class 3 coating, soft temper. Mesh openings for 8 × 10 type are nominally 3.25 in × 4.5 in (83 mm × 114 mm). Use a wire with a minimum nominal diameter of 0.120 inch (US Steel Wire Gage No. 11, 3.05 mm) and a minimum tensile strength of 60,000 pounds per square inch (414 MPa), as tested according to ASTM A370, to manufacture the mesh. Include the zinc when calculating the tensile area. Furnish locking clips, lacing wire, and fasteners (hog rings) conforming to the above requirements except the minimum nominal diameter is 0.148 inch (US Steel Wire Gage No. 9, 3.80 mm).

Cable Net. Furnish cable net consisting of individual square cable net panels joined along their edges. Furnish cable net panels composed of woven wire ropes with a maximum opening

size of 12 in × 12 in (305 mm × 305 mm). Securely fasten wire ropes where they cross using a clip strong enough to resist slipping or breaking when subject to the loads generated by the design conditions.

Use a galvanized wire rope with a minimum diameter of 5/16 inch (7.9 mm) and a minimum breaking strength of 9,000 pounds (40 kN) to manufacture the cable net. Use the same wire rope to lace the cable net panels together.

Top Horizontal Support Wire Rope. The top of the slope drape is secured to a top horizontal support wire rope. For the wire rope used to support wire mesh, furnish a galvanized wire rope with a minimum diameter of 0.5 inch (12.7 mm), and a minimum breaking strength of 25,000 pounds (111 kN). For the wire rope used to support cable net, furnish a galvanized wire rope with a minimum diameter of 0.75 inch (19 mm), and a minimum breaking strength of 50,000 pounds (222 kN). Furnish additional wire rope meeting these requirements to use as tag lines to connect the perimeter rope to the anchors.

Anchors. Furnish either steel bolt or wire rope anchor types. For steel bolt anchors, furnish a 1-inch (25 mm) diameter, galvanized, continuously threaded or deformed steel bar conforming to ASTM A615, Grade 75, with a minimum ultimate strength of 79,000 lbs (351.4 kN). For wire rope anchors, furnish a galvanized 0.75 inch (19 mm) wire rope with a minimum breaking strength of 50,000 pounds (222 kN). Furnish centralizers fabricated from Schedule 40 PVC plastic pipe or tube, steel or other material not detrimental to the anchor. Do not use wood.

For soil anchors, furnish concrete conforming to C&MS 499, Class F, or grout conforming to the requirements for rock anchors.

For rock anchors furnish grout consisting of a neat cement or sand/cement mixture. Furnish Type I, Type II, Type III, or Type IV cement conforming to ASTM C150 for the grout. Expansive admixtures may be used. Admixtures which control bleed or retard set may be used if approved by the Engineer. Furnish grout with a minimum 3-day compressive strength of 1500 psi (10.5 MPa) and a minimum 28-day compressive strength of 3000 psi (21 MPa) per AASHTO T106/ASTM C109.

If using a steel bolt anchor, furnish a 0.375 inch (9.5 mm) thick, galvanized, 6-inch square or round mild steel bearing plate. The plate must have a rounded edge on the side in contact with mesh wire and/or anchor cable. Furnish a galvanized flat washer and hex nut torqued to 100 ft- lbs. Furnish wire rope clips compatible with the cable sizes shown in the plans, with drop forged carbon steel bases and heavy-duty hexagonal type nuts. Use thimbles and wire rope clips in accordance with the manufacturer's recommendations for size, number, spacing and torque.

221.6.1-Work Plan, Slope Drape: Installation of the slope drape shall be included on Work Plan, as noted in 221.3.2. Include the following minimum information for the plan:

1. Complete working drawings and engineering calculations, prepared, signed, sealed and dated by a Professional Engineer.
2. Proposed construction sequence and schedule.
3. Proposed anchor drilling methods and equipment, including drill hole diameter and length proposed to achieve the required pullout resistance.
4. One sample of the proposed type of wire mesh and cable net, ground anchor, and hardware (bearing nuts and plates) from the normal stock of the supplier. With the samples, include certified mill reports indicating tensile yield point and elongation results of the ground anchors, and the tensile and punching tests of the cable net

and wire mesh.

5. Submit the grout design and include the following:
   a. Manufacturer's certified test results of set time, shelf life, and compressive strength.
   b. Type of Portland cement.
   c. Aggregate source and gradation.
   d. Proportions of mix by weight and water-cement ratio.
   e. Manufacturer, brand name and technical literature for proposed admixtures.
   f. Results of compressive strength tests performed according to AASHTO T106/ASTM C109 and completed no more than one year before the start of grouting. Use an AASHTO accredited independent testing lab to verify the specified minimum 3 and 28-day grout compressive strengths.
6. Proposed anchor grout placement procedures and equipment.
7. Proposed anchor testing methods and equipment setup.
8. Identification number and certified calibration records for each test jack, pressure gauge and load cell to be used.
9. The manufacturer's recommended maintenance program for the slope drape.

221.6.1-Installation:

211.6.1.1-Anchors. Design the anchor type, dimensions, and spacing to support the loads determined from the slope drape design. Do not exceed a primary anchor spacing of 100 feet and 12 feet for intermediate anchor spacing for slope drape. Determine the anchor length to meet the requirements of the pullout test. Do not use an anchor length less than 10 feet (3.05 m). Ground conditions may require anchors that are longer than the minimum length. Where the lengths of the anchors vary, the Engineer will permit the use of threaded couplers to extend the anchor tendon, or other methods recommended by the manufacturer.

Do not use water during drilling. Provide a uniform hole diameter for the entire length of the hole unless otherwise approved by the Engineer. The minimum hole diameter is shown on the plans. Drill holes within five degrees of the orientations and inclinations shown on the plans. Clean the hole before installing the anchor.

Place at least two centralizers on each anchor to position the tendon within 1 inch (25 mm) of the center of the hole. Place the centralizers within 2 feet (0.6 m) of the top and bottom of the hole. Securely attach the centralizers to the anchor tendon.

Test at least five (5) percent of the anchors and at least one (1) anchor of each type of anchor, soil, and rock. The Engineer will select the location of each test anchor. Perform each test in the presence of the Engineer. Each pullout test consists of incrementally loading the anchor assembly to the maximum test load or to failure, whichever occurs first. Failure is defined as when the movement of the anchor continues without an increase in the load or when the anchor has displaced 2 inches (50 mm). If more than 20 percent of the tested anchors fail, increase the number of tested anchors to 50 percent of the total. Replace all failed anchors and retest them at no additional cost to the Department.

Apply the test load by jacking against a temporary yoke or load frame. No part of the yoke or load frame may bear within 3 feet (0.9 m) of the anchor. Measure the applied test load using either a calibrated pressure gage with graduations no greater than 100 psi (0.7 MPa) or a calibrated load cell. Calibrate the pressure gage and the hydraulic jack as a unit and provide the certified calibration chart. Calibrate against a test machine whose calibration is traceable to the National Institute of Standards and Technology (NIST).

Ensure the calibration is done to an accuracy of 2 percent and at least one year before shipment to the project. Measure movement of the anchor using dial gages that have an accuracy of 0.001 inch (0.03 mm). Measure movement relative to a fixed reference point that is at least 3 feet (0.9 m) from the anchor and yoke or load frame. Record all measurements, including the failure load if failure occurs.

Load each anchor in the following sequence (ADL = allowable design load):

Load	Hold Time
AL (0.05 ADL max.)	Until Stable
0.25 ADL	Until Stable
0.50 ADL	Until Stable
1.00 ADL	Until Stable
1.50 ADL	Until Stable

The alignment load (AL) is the minimum load required to align the testing equipment and should not exceed 5 percent of the ADL. Dial gages should be set to “zero” after the alignment load has been applied.

Unload the anchor after completion of the test.

211.6.1.2-Slope Drape. Install the slope drape according to the manufacturer’s recommendations when they do not conflict with the plans or specifications.

Have a representative from the slope drape manufacturer on site for at least one day at the beginning of the slope drape installation work to train and provide guidance on the installation of the slope drape. Have the slope drape manufacturer inspect the installed drape and submit to the Department a statement declaring that the slope drape was installed according to the manufacturer's requirements and recommendations.

Connect the wire mesh and cable net together before placing the slope drape on the slope. Securely fasten the wire mesh to each cable net panel and to the lacing. Fasten the wire mesh and cable net so they are flush without any gaps that exceed 4 inches (100 mm). No discontinuities in the wire mesh are allowed. Attach the mesh every 12 inches (305 mm), horizontally and vertically, using galvanized steel fasteners, approximately 0.148 inch in diameter (US steel wire gauge 9, 0.377 mm), after coating. Use fasteners that have a connection strength equal to or greater than the strength of the mesh.

Connect the cable net panels using 5/16 inch (7.9 mm) lacing cable (seam rope) through each square of the net. Loop the end of the seam rope back on itself and secure it with two 5/16 inch (7.9 mm) rope clips. Place the wire mesh between the slope and the cable net. Place the slope drape so it follows the contours of the slope and minimizes gaps and large spaces between the drape and the ground surface. Secure the top of the slope drape to a top horizontal support wire rope. Position the top support rope at least 5 feet (1.5 m) above the top of the cut slope. Use top horizontal support ropes that are no longer than 100 feet (30.5 m) each. Interior horizontal support ropes are not required.

Connect wire ropes (tag lines) to the end of the anchors and secure the ends of the wire rope with wire rope clips. Install the wire rope clips according to the manufacturer’s recommendations.

221.7-ROCKFALL ATTENUATOR BARRIER:

This work shall consist of constructing an attenuator rockfall barrier fence as specified herein, as instructed by the manufacturer, and as shown on the Plans. The Contractor shall furnish

all labor, materials and equipment required for completing the work. The Contractor shall select the equipment, installation method for anchor and post foundations, and grouting procedures to meet the performance requirements specified herein, as instructed by the manufacturer, and approved by the Engineer.

This work includes but is not limited to installing attenuator rockfall barrier posts; drilling anchor holes to the specified minimum depth and orientation indicated herein; providing, placing, and grouting the anchors into the drill holes; performing pullout testing; and fastening wire mesh, nets, and rope net. The permanent rockfall protection system that shall be capable of absorbing, arresting, and retaining Maximum Energy Level (MEL) of 2000kJ of kinetic energy to eliminate rockfall bounce and rockfall landing in the traveling roadway.

221.7.1-Materials:

Ring Net. Ring net shall be defined as fabric consisting of interlocking steel rings, each ring with a diameter of no more than 14 inches. Each ring shall connect to the four or six adjoining rings by passing through them; they must be interlocked. Use high tensile strength steel wire with a nominal 0.12-inch (3 mm) diameter with a minimum breaking strength of 198,700 psi. A minimum of 5 strands shall be bundled into each ring. Steel wire used in the fabrications of the ring net shall be galvanized.

Cable Net / Woven Wire Rope Net. Cable/Woven wire rope nets shall have a uniform grid pattern, shall be constructed of galvanized aircraft cable, with a square or diamond weave, and must have no more than a 12-inch opening size. Nominal opening size for cable nets/wire rope nets may be specified on the contract documents as 6, 8, 10, or 12 inches. Connectors used to fasten adjacent panels shall have connection strength equal to or greater than the connection strength of the net.

High Tensile Wire Mesh. High tensile wire mesh shall be of woven construction with a minimum nominal wire diameter of at least 0.15-inch (4-mm). The wire shall have ends formed into a loop and twisted with loops fastened together to prevent unraveling of the mesh. This wire shall have a minimum of 250,000 psi breaking strength. The mesh shall have a minimum longitudinal tensile strength or load capacity of at least 10,000 lbs/ft.

Wire Mesh. When added to a rockfall barrier system, wire mesh shall be securely attached to the cable or ring net fence. Spacing of tie wire or connectors shall be in accordance with manufacturer's recommendations. This mesh shall be flush with no gaps exceeding 4 inches. Tie wires or connectors used to fasten the wire mesh to the cable net of adjacent panels shall have connection strength greater than or equal to the strength of the mesh.

Net Support Posts. Posts shall be fabricated from steel meeting ASTM A36 for pre-formed steel shapes, except as otherwise approved in writing, as part of an approved rockfall barrier system prior to letting of contract. Posts shall be as specified in the certified rockfall barrier equipment list and substitutions are not permitted unless posts for a higher capacity system by the manufacturer are substituted and the manufacturer certifies that the substitution is acceptable. Test results shall be required to prove that the system and posts are capable of resisting design loads as specified in general requirements above. Substitutions of different net support post members after contracts are issued shall not be allowed.

Net Support and Lateral Bracing Ropes. Braking element design shall have been verified through testing and certification of the rockfall barrier to ensure satisfactory performance and a minimum of required maintenance. Written documentation of testing of braking elements used with support or bracing ropes shall be supplied to the Engineer upon request.

Rock and Soil Anchors. Anchors shall meet the requirements of the Foundation Details and Wire Rope Anchor Details. Anchors in rock and soil shall be installed per manufacturer's recommendations for the Rockfall Barrier.

Epoxy and Grout. Epoxy shall be in accordance with manufacturer specifications and that of the Department. Grout shall be a neat-cement or a sand-cement grout consisting of a pumpable mixture capable of reaching a 3-day compressive strength of 1500 psi and 28-day compressive strength of 3500 psi, in accordance with AASHTO T 106. Chemical additives that control bleed, improve flowability, reduce water content, or retard set in the grout are to be used only when approved in writing by the Department. Accelerators shall not be permitted. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations.

Cement. Shall conform to the requirements of Subsection 701.1.

Grout in Footings and Anchors. Grout shall meet the requirements in Subsection 707.

Fine Aggregate. Shall conform to the requirements of Subsection 702.

Corrosion Protection. Rock anchors shall be galvanized in accordance with ASTM A767 or epoxy coated. Epoxy coating applied electro-statically to the anchor shall be 14 mils to 18 mils in thickness. The epoxy coating shall be in accordance with AASHTO M 284. Bend test requirements shall be waived.

Any and all miscellaneous materials associated with the rockfall barrier fence including, but not limited to, wire rope clamps, eyelets, and bolts shall be hot-dipped galvanized.

Miscellaneous Materials. All miscellaneous hardware such as wire rope clips, thimbles, bolts, shackles, etc., shall be supplied by the manufacturer with the rockfall barrier. Shackles shall be used to fasten nets to each other and to the net support ropes, unless specifically not allowed by the manufacturer.

All structural steel components, including anchors and clamps, shall conform to the requirements in ASTM Designation A36. All bolts, nuts, and washers shall conform to the requirements in ASTM Designation A325 and as required to conform to the tested rockfall barrier.

Storage - Store cement to prevent moisture degradation and partial hydration. Do not use cement that has become caked or lumpy. Store aggregates so that segregation and inclusion of foreign materials are prevented. Do not use the bottom six (6) inches of aggregate piles in contact with the ground.

Steel shall be stored on supports to keep the steel from contact with the ground, in a manner that eliminates bending. Damage to the steel as a result of abrasion, cuts, nicks, welds and weld splatter shall be cause for rejection by the Department. Protect steel from dirt, rust and other deleterious substances prior to installation. Heavy corrosion or pitting of steel shall be cause for rejection. Light rust that has not resulted in pitting is acceptable.

Rockfall fence and posts shall be powder coated to match US Government Federal Standard Color 595C 26255, or approved alternate.

221.7.2-Installation:

Excavation - The foundation work for the posts shall be performed in accordance with the typical sections for the fence system details shown on the design drawings. The distance from centerline to centerline of the posts must be kept as close as possible to that shown on the manufacturer's approved design drawings and cannot exceed plus or minus 3 inches of the distance except as approved by the Engineer. In addition, do not vary the posts from the

indicated pitch, or from vertical, by more than 2 inches from top to bottom of the post. All loose soil or rocks shall be removed from the holes.

Dispose of excess excavated material in a similar manner as other ditch work material on the project.

Support the anchor bars or cables in the center of the drilled holes with centralizers spaced a maximum of 2 ft on center.

Barrier Fence and Foundation Installation - Verify that all materials are marked by the manufacturer in order to identify the materials on the shop drawings.

Install the rockfall protection barrier fence in accordance with the procedures, tolerances, and requirements of the manufacturer, as shown on the plans, as specified in these provisions, and as directed.

Install the foundations and post foundations in accordance with the procedures, tolerances, and requirements of the manufacturer, as shown on the plans, as specified in these provisions, and as directed.

Use of neat cement in post foundations or sand-cement grout in cable anchor foundations shall conform to the requirements of the manufacturer, as specified in these provisions, and as directed. Submit the proposed grout mix design to the Department for review and approval in accordance with the Submittal section. The design mix submittal shall include compressive strength test results verifying that the proposed mix design will have a 3-day minimum compressive strength of 1500 psi and a 28-day minimum compressive strength of 3500 psi.

Previous test results for the proposed grout mix completed within one (1) year of the start of work may be submitted for initial verification of the required compressive strengths for installation of pre-production verification test anchors and initial production anchors. During production, anchor grout shall be tested by the Contractor in accordance with AASHTO T 106/ASTM C109 at a frequency of no less than one (1) test per day that grout is placed. All testing shall be performed in an AMRL-accredited laboratory. Provide grout cube test results to the Department within 24 hours of testing.

Grout the drill hole after installation of the wire rope anchor and foundations. Each drill hole shall be grouted within two (2) hours of completion of drilling, unless otherwise approved by the Department. Cold joints are not allowed in the grout column. Grouting before insertion of the anchor is allowed provided the anchor is immediately inserted through the grout to the specified length without difficulty.

Maintain grout pressures or vibration sufficient to ensure that the drill hole shall be completely filled. Control grout pressures to prevent excessive ground heave or fracturing. Remove the grout and anchor if grouting is suspended for more than thirty (30) minutes or does not satisfy the requirements herein and replace with fresh grout and undamaged anchor at no additional cost.

No drilling or installation of wire rope anchors and foundations shall be permitted in any soil/rock unit until successful pre-production verification testing of anchors is completed in that unit and approved by the Department. Install verification test anchors using the same equipment, methods, anchor and drill hole diameter as planned for the production anchors. Perform pre-production verification tests in accordance with the Verification Testing section prior to installation of production anchors in the specific unit in which the designated verification test anchors are located. The number and location of the verification tests will vary depending on site conditions.

The Contractor shall select drilling equipment and methods suitable for the ground conditions as dictated by the site conditions. The Contractor shall also select drill hole diameter(s) required to develop the specified pullout resistance and to also provide a minimum one (1) inch grout cover around the anchor bars. It is the Contractor's responsibility to determine the final drill hole diameter(s) required to provide the specified pullout resistance. Use of drilling muds such as bentonite slurry to assist in drill cutting removal is not acceptable, but air may be used. With the Department's approval, the Contractor may be allowed to use water or foam flushing upon successful demonstration, at the Contractor's cost, that the installation method still provides adequate anchor pullout resistance. If caving ground is encountered, use cased drilling methods to support the sides of the drill holes. Where hard drilling conditions such as rock, cobbles, boulders or obstructions are encountered, percussion or other suitable drilling equipment capable of drilling and maintaining stable drill holes through such materials may be used.

The Contractor shall immediately suspend or modify drilling operations if ground movement is observed, if the rock slope or anchors are adversely affected or if adjacent structures are damaged from the drilling operation. Immediately stabilize the adverse conditions at no additional cost.

211.7.3-Proof Testing of Production Anchors: The Contractor shall perform proof testing on 5% of all production anchors. Rock anchors shall have a minimum pullout strength of 15 tons (or more if required by specific manufacturer fence design) and must be verified by the contractor in the field. The testing shall consist of a pullout test on 5% of all anchors. Testing shall be performed against a temporary yoke or load frame. No part of the yoke or load frame shall bear within 3 feet of the anchor.

Rock anchors shall be considered acceptable when held under maximum load for a minimum of three (3) minutes without movement of more than 0.10 inch. Movement of an anchor shall be cause for rejection of that anchor and any others installed on the same day except that each anchor installed that day may be tested and accepted individually.

If a test anchor does not satisfy the acceptance criteria, the Contractor shall determine the cause. The Department shall evaluate the results of each proof test. Installation methods that do not satisfy the rock anchor testing requirements shall be rejected. The Contractor shall propose alternative methods and install replacement verification test anchors. Contractor modifications may include, but are not limited to, the installation of additional proof test anchors, increasing the drill hole diameter to provide increased capacity, modifying the installation or grouting methods, reducing the production anchor spacing from that shown herein, and installing more production anchors at a reduced capacity or installing longer production anchors. Installation and testing of additional proof test anchors or installation of additional or modified rock anchors as a result of proof test anchor failure(s) shall be at no additional cost to the Department.

Successful proof tested rock anchors meeting the above test acceptance criteria may be incorporated as production anchors.

211.7.4-Installation Records: Records documenting the rock anchor and rockfall barrier fence construction shall be maintained by the Contractor's Engineer, unless specified otherwise. The Contractor shall provide the Department with as-built drawings showing as-built rock anchor locations within five (5) calendar days after completion of the anchor curing and/or testing.

211.7.5-Certificate of Compliance: The Contractor shall provide the Engineer with a Certificate of Compliance from the manufacturer in accordance with the provisions of the Standard Specifications.

A Certificate of Compliance shall be provided to the Engineer certifying that the materials, additional corrosion protection and rockfall barrier to be furnished conform to the requirements of these special provisions. The Certificate of Compliance shall be supported by a certified copy of the results of tests performed by the manufacturer.

221.8-ATTENUATOR BARRIER DRAPE:

This work is for furnishing and installing draped wire mesh in conjunction with the Attenuator Barrier. The Contractor shall furnish all labor, materials, equipment and incidentals required for completing the work. The Contractor shall select the method and equipment to meet the performance requirements specified herein.

221.8.1-Materials: Attenuator Barrier Drape materials shall conform to the requirements of 211.5.1.

221.8.2-Work Plan, Attenuator Barrier Drape: Installation of Attenuator Barrier Drape shall be included on Work Plan, as noted in 211.3.2. The plan shall also include the information in 211.5.2.

211.8.3-Installation: Install mesh at the locations identified on the drawings or as directed by the Representative. Fasten ends of mesh with wire rope anchors in accordance with the Contractor's design. Install the wire mesh in vertical strips to the limits as shown on the Contract drawings or as directed by the Representative. Install all wire mesh in accordance with the slope treatment details and as directed by the Representative. Install all fasteners, connectors, ropes and associated hardware in accordance with the manufacturer's recommendations.

Configuration and load testing of wire rope anchors to support the ends of the wire mesh will be in accordance with the Contractor's design.

211.8.3- Wire Rope Anchor Testing: Perform proof testing on a minimum of five (5) percent of wire rope anchors at each cut location as selected by the Contractor and approved by the Engineer.

221.9-ROCKFALL BARRIER:

This work shall consist of constructing a rockfall barrier fence as specified herein, as instructed by the manufacturer, and as shown on the Plans. The Contractor shall furnish all labor, materials and equipment required for completing the work. The Contractor shall select the equipment, installation method for anchor and post foundations, and grouting procedures to meet the performance requirements specified herein, as instructed by the manufacturer, and approved by the Engineer.

This work includes but is not limited to installing rockfall barrier posts; drilling anchor holes to the specified minimum depth and orientation indicated herein; providing, placing, and

grouting the anchors into the drill holes; performing pullout testing; and fastening wire mesh, nets, and rope net.

The term "rockfall barrier fence" as used in these specifications is intended as a generic term and refers to a permanent rockfall protection system that shall be capable of absorbing, arresting, and retaining Maximum Energy Level (MEL) of 2000kJ of kinetic energy to eliminate rockfall bounce and rockfall landing in the traveling roadway.

221.10 AND 221.11-BLANK

221.12-METHOD OF MEASUREMENT:

The quantities of work will be measured as follows:

211.12.1-Rock Slope Scaling: Scaling will be measured in square yards. The quantity will be determined by the Plan Quantity as provided in the proposal unless otherwise directed by the Engineer.

211.12.2-Pinned Wire Mesh: Pinned Wire Mesh will be measured in square yards. The quantity will be determined by the Plan Quantity as provided in the proposal unless otherwise directed by the Engineer and shall include overlap of wire mesh rolls needed to properly cover the slope face.

211.12.3-Slope Drape: Slope Drape will be the number of square yards of surface area of installed. Overlap areas of slope drape, anchors, and anchor tests are incidental to the slope drape and will not be measured separately.

211.12.4-Rockfall Attenuator Barrier: The Rockfall Attenuator Barrier will be measured in linear feet, complete in place and accepted. The price for the system shall be full compensation for all material including freight, supervision, engineering, drawings and spare parts; plus labor, equipment, tools, royalties and other incidentals necessary to install a complete system ready to use.

Proof anchor tests shall be measured on a unit basis for each test successfully completed. Failed or additional proof test anchors installed to verify alternative anchor installation methods proposed by the Contractor shall not be measured.

211.12.5-Attenuator Barrier Drape: Attenuator Barrier Drape will be the number of square yards of surface area of installed. Overlap areas of slope drape, anchors, and anchor tests are incidental to the slope drape and will not be measured separately.

211.12.6-Rockfall Barrier: The Rockfall Barrier will be measured in linear feet, complete in place and accepted. The price for the system shall be full compensation for all material including freight, supervision, engineering, drawings and spare parts; plus labor, equipment, tools, royalties and other incidentals necessary to install a complete system ready to use.

Proof anchor tests shall be measured on a unit basis for each test successfully completed. Failed or additional proof test anchors installed to verify alternative anchor installation methods proposed by the Contractor shall not be measured.

221.13-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 prices and payment shall be full compensation for furnishing all the materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies and incidentals necessary to complete the work.

221.14-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
221002-001	Scaling	Square Yard
221004-001	Pinned Wire Mesh	Square Yard
221006-001	Slope Drape	Square Yard
221008-001	Rockfall Attenuator Barrier	Linear Foot
221010-001	Attenuator Barrier Drape	Square Yard
221012-001	Rock Fall Barrier, “Height”	Linear Foot

“Height” = Barrier Height, in feet