20220803 - August's Specifications Committee Meeting

August Specifications Committee Meeting Agenda

Meeting Date

Wednesday, August 3, 2022 @ 9:00am

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

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

Approved Permanent Specification changes from last Committee meeting (6/1/22)

- Three specification changes related to Temporary Traffic Signal / Wood Support
  - **Section 636.20-Temporary Traffic Signals or Temporary Lighting, 636.23.16-Temporary Traffic Signal, 636.23.23-Temporary Lighting, & 636.25-Pay Items** Update clarifies temporary traffic signal requirements and payments.
  - **Subsection 710.8-Service Lighting, and Class D Traffic Signal Poles**
  - **Subsection 715.42.9.3-Wood Pole Signal Support (Type D)**
- **Section 102.5.3-Bidding Requirements.** Clarifies the Categorizes of Work requirments.
- Three specification changes, updating references to Section 103 of supplemental specs
  - **Subsection 106.1-Source of Supply and Quality Requirements**
  - **Subsection 107.8.2.1-Contractor's Public Liability Insurance and Protective Public Liability Insurance & 107.8.2.2-Railroad Protective Liability Insurance**
  - **Subsection 109.4.5-Contract Bond & 109.4.6-Insurance**
- **Section 601.5.2.3-Scales.** Adds MP reference
- **Section 658.5.6.3-Installation Procedure.** Updates nut tightening procedure for overhead sign structures.
- **Section 715.14.2-Approval of Bearing Pads without Shims.** Adds approval of bearing pads without shims.

Approved Project Specific Special Provisions (SP) from last Committee meeting (6/1/22)

- **None**

Items removed from Committee Agenda

- **SP665-Water Well Survey**

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 WVDOH	**9th 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 bonus structure has been removed from specifications; these changes are redline copy with yellow highlights.

		No update to the specification. Approval is expected in August.
102	**102.5.3-Bidding Requirements** S. Danberry	**3rd time to Committee. Discussed in April & June.** 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. Specification has been updated; adding acknowledgement of monetary obligations owned to the state to the form. It is redline copy showing the revisions. Approval is expected in August.
508 **720**	**508.9-Smoothness** **Section 720-Smoothness Testing** B. Whelan	**3rd time to Committee. Discussed in April & June.** Two specification changes removing bonus structure from Section 508 and Section 720. 1. Section 508, Subsection 508.9-Smoothness 2. Section 720-Smoothness Testing No update to the specification; they are redline copy showing the revisions. Approval is expected in June.
636 **104** **715**	**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 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	**3rd time to Committee. Discussed in April & June.** 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 No update to the specification; they are redline copy showing the revisions. Approval is expected in August.

704	**704.4-Dump Rock Gutter** R. Shuman	**3rd time to Committee. Discussed in April & June.** Specification change to Section 704-Stone and Crush Aggregates. The revision clarifies the type of rock for dump rock gutter. No update to the specification; it is redline copy showing the revisions. Approval is expected in August.
709	**709.1-Steel Bars for Concrete Reinforcement** G. Hanna	**3rd time to Committee. Discussed in April & June.** Specification change to Section 709-Metals. The revision updates plain and deformed bar reinforcement and adds subsections for galvanized and epoxy coated reinforcement. No update to the specification; it is redline copy showing the revisions. Approval is expected in August.
221	**SP221-Rockfall Mitigation** T. Priddy	**3rd time to Committee. Discussed in April & June.** 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. No update to the provision. Approval is expected in August.
SP 601	**SP 601-Surface Resistivity** A. Thaxton	**Update to previously approved SP. 2nd time to Committee. Discussed in June.** Project Specific Special Provision (SP) for surface resistivity. The SP has been updated; with revision to reference to AASHTO R100. It is redline copy showing the revisions. Approval is expected in August.
401	**401.13-Basis of Payment** S. Boggs	**2nd time to Committee. Discussed in June.** Proposed specification change to Section 401; the subsection references to Table 401.7.2 & these were removed previously, so the entire subsection can be removed No update to the specification; it is redline copy showing the revisions. Approval is expected in August.

403	**Specification 403-Crack Sealing in Asphalt Pavement** S. Boggs	**2nd time to Committee. Discussed in June.** Proposed specification change adding Crack Sealing of Asphalt Pavement to the spec book. This item has traditionally been utilized via SP 403. No update to the specification. It is redline copy showing the revisions to the current version of the SP. Approval is expected in August.
SP 601	**SP 601-FRP** D. Estep, GPI	**2nd time to Committee. Discussed in June.** Project Specific Special Provision (SP) for FRP. No update to the SP. Approval is expected in August.
602	**Specification 602-Reinforcing Steel** S. Boggs	**2nd time to Committee. Discussed in June.** Proposed specification change to Section 602-Reinforcing Steel; the updates the material requirments and adds galvanized steel requirments. The specification has been updated; it is redline copy showing the revisions. Approval is expected in August.
625	**Specification 625-Rock Socketed Drilled Shaft** S. Boggs	**2nd time to Committee. Discussed in June.** Proposed specification change to Section 625-Rock Socketed Drilled Shaft; Division's contact information updated and clarify testing on Alternative Project Delivery. No update to the specification; it is redline copy showing the revisions. Approval is expected in August.
628	**SP 628-Exploratory Drilling and Sampling** A. Wentz	**2nd time to Committee. Discussed in June.** Project Specific Special Provision (SP) for exploratory drilling and sampling. No update to the SP. Approval is expected in August.

642	**642.1-General, 642.5.1-General, 642.7-Method of Measurement, & 642.9-Pay Items** S. Boggs	**2nd time to Committee. Discussed in June.** Proposed specification change to Section 642-Temporary Pollution Control; remove sediment dam/pond verbiage and using WVDEP sediment basin in section and clarify method of measurement. No update to the specification; it is redline copy showing the proposed changes. Approval is expected in August.
642	**642.7.1-Temporary Pollution Control, Unit Value Method, & 642.9-Pat Item** S. Boggs	**2nd time to Committee. Discussed in June.** Proposed specification change to Section 642-Temporary Pollution Control; adding unit value method to the section. The specification has been updated; adding Note 2 to Table 642.7. Approval is expected in August.
663	**663.8-Pay Items** S. Boggs	**2nd time to Committee. Discussed in June.** Proposed specification change to Section 663-Pavement Markings; revising pay item description, so that it matches with TEM-3 'Lane Reduction Arrow, Type V'. No update to the specification; it is redline copy showing the revisions. Approval is expected in August.
708	**708.3-Joint and Crack Sealant, Hot-Poured for Concrete and Asphalt Pavements** S. Boggs	**2nd time to Committee. Discussed in June.** Update subsection title to include 'crack' repair. No update to the specifiation; it is redline copy showing the revisions. Approval is expected in August.
711	**711.5.3-Approval, 711.6.1.1-General, 711.22.1-General, 711.22.4-Top Coat, & 711.23-Sample Submission and Approval** K. Trent	**2nd time to Committee. Discussed in June.** Proposed specification change to Section 711-Paints, Coating, Oil, and Inks. Update clarifies NTPEP testing & adds subsection on Sample Submission and Approval. No update to the specification; it is redline copy showing the revisions. Approval is expected in August.

New Business - New Provisions for Spec Committee

SECTION	TITLE	DESCRIPTION
DBE	**SP for DBE** S. Johnson	**This is an update to previously approved SP. 1st time to Committee.** Update to the DBE utilization Special Provision used on Federally Funded projects. The revision adds reference to the Civil Rights Compliance Division and updates DBE Participation Plan submission requirements. The provision is redline copy, showing the changes/updates to the existing special provision.
106	**106.1-Sourse of Supply and Quality Requirements** D. Simmons	**1st time to Committee.** Proposed specification change to Section 106-Measurement and Payment. Updating the Buy America requirements to correlate with new federal law (Infrastructure Investment and Jobs Act). The revision separates the subsection into state funded and federal funded projects.
109	**109.20-Weight Tickets & 109.20.1-Electronic Ticket Delievery** S. Smith	**1st time to Committee.** Proposed specification change to Section 106-Measurement and Payment. The revision adds electronic ticket delivery subsection, mandating e-tickets (in addition to paper tickets) for asphalt, aggregate, and concrete. The specification is redline copy showing the revisions.
401	**Section 401-Asphalt Base, Wearing, and Patching and Leveling Courses** S. Jack	**1st time to Committee.** Proposed specification change to Section 401-Asphalt Base, Wearing, and Patching and Leveling Courses. It is a complete section rewrite, updating typos & terminology; removal of thin lift corrections; acceptance testing responsibly to the Division; and bonus structure was removed. The specification change has been vetted through the Asphalt subcommittee and reviewed/discussed at District Materials Quarterly meeting. The specification is redline copy showing the revisions.
623	**623.2-Materials & 623.6.5-Combined Aggregate Gradation** M. Perrow	**1st time to Committee.** Proposed specification change to Section 623-Shotcrete. Update adds tolerances and quality assurance sampling requirements to ensure a move uniform concrete mix. The specification is redline copy showing the revisions.

661	**661.2.3-Retroreflective Sheeting and Matched Components** T. Whitmore	**1st time to Committee.** Proposed specification change to Section 661-Traffic Signs and Delineators. The update clarifies fluorescent yellow sheeting requirements on road signage. The specification is redline copy showing the revisions.

Comments

Comments are requested on these Specifications Changes and Project Specific Special Provisions. Please share your comments by **July 27, 2022**, they help in the decision making process.

Please Send Comments to: DOHSpecifications@wv.gov

Deadline for new items & updates to these provision is September 9, 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, **October 5, 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. When lots are adjusted, all sublots shall be of equal size. 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 equal sublots~~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~~ equal sublots (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

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 THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The bidder must complete all sections contained in the ~~Notice to Contractors~~ Bidding Requirements and check the box indicating he or she has read, understands, and intends to comply with all documents contained in the proposal.

DELETE BULLET vi. AND REPLACE THE FOLLOWING:

vi. Section H: West Virginia Contractor Licensing Act Chapter ~~21~~ 30Article ~~11~~ 42 Code of West Virginia License Number – The proposal shall comply with West Virginia Contractor Licensing Act, Chapter ~~21~~ 30, Article ~~11~~ 42 Code of West Virginia, except that on Federal-Aid Projects a n unexpired Contractor's license is not required at time of bid but will be required before a project will be awarded.

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.

ADD BULLET xi. TO THE END:

xi. Section M: Monetary Obligations Owed to the State – Bidder must acknowledge that, pursuant to W. Va. Code § 5-22-1(i), the bidder is not in default on any monetary obligation owed to the State of West Virginia or a political subdivision of the State of West Virginia, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

102.12-IRREGULAR PROPOSALS:

DELETE BULLET vii. AND REPLACE THE FOLLOWING:

vii. Failure to show the unexpired West Virginia Contractor's License Number when required in Section H of the notice contained in the proposal.

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~~

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:

720.6.3-Final Price Adjustments:

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

~~**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:~~	

~~Percent Improvment (%)~~

$$= \frac{\text{~~Before IRI of Lot − After IRI of same Lot~~}}{\text{~~Before IRI of Lot~~}} \text{ ~~X 100~~}$$

720.6.3-Final Price Adjustments: If the average precent improvement for the entire project is 30.1% or more, no price adjustment will be assessed for the project. If the average percent improvement for the entire project is 30.0% or less, then each 0.1 mile lot that has an IRI of 80.1 or greater, will be penalized based on the following table. Table 720.6.3.

TABLE 720.6.3
Non-NHS Pavement Projects

IRI for each 0.1-mile section (in/mi)	**Price Adjustment ($ per 0.1-mile Section)**
80.1 – 170.0	320 - 4(IRI)
170.1 or Greater	-360

Where:

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

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:

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

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.~~

~~February 22, 2022~~ May 11, 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 that is not classified as shale or shale-like. This rock 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 inorganic material not classified as shale or shale-like may be deemed suitable for use. This material shall be deemed suitable by visual inspection and approved by the Engineer before installation.

~~January 27, 2022~~ April 11, 2021

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~~ The galvanized coating shall ~~meet~~ conform to the requirements of ASTM A767 for the immersion

process or ASTM A1094 for the continuous hot dip galvanizing process, unless otherwise specified in the Contract Documents. All field handling and repair requirements shall conform to ASTM A767 or ASTM A1094 as applicable.

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.

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
7. Localized Rock Bolting

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 performed 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 mitigation devices 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:

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 proper 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 includes 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.

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.

Scaling of loose or potentially unstable rock shall be accomplished by manual or mechanical 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

Furnish 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.

Furnish 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 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.

221.6.2-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 registered in the State of West Virginia.
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.

221.6.3-Installation:

211.6.3.1-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. 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 of the center of the hole. Place the centralizers within 2 feet 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. 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 of the anchor. Measure the applied test load using either a calibrated pressure gage with graduations no greater than 100 psi 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. Measure movement relative to a fixed reference point that is at least 3 feet 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.

211.6.3.2-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. No discontinuities in the wire mesh are allowed. Attach the mesh every 12 inches, 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 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 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 above the top of the cut slope. Use top horizontal support ropes that are no longer than 100 feet 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 Attenuator 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 and in accordance with the manufacturer's requirements. 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 Engineer. 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 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.

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-LOCALIZED ROCK BOLTING:

This work shall consist of furnishing and installing rock bolts in accordance with this special provision, AASHTO LRFD Bridge Construction Specifications (4th Edition, 2017), and in reasonably close conformity with the dimensions, locations and details shown on the Plans or established by the Engineer.

221.10.1-Materials: Materials shall conform to the following requirements:

Material	Subsection
Portland Cement	701.1
Fine Aggregate	702.1
Prestressing Steel	709.2
Structural Steel	709.12

Minimum grout strength at stressing shall be 3,500 psi. Expansion additives in grout will not be allowed. Grout shall not be re-tempered or used after it has begun to set. Proportioning and testing of grout (including requirements for submission to the Department), quality control, and testing of grout (including number, size, and shape of samples) shall conform to the applicable provisions of Subsections 601.3 and 601.4.

All other materials, including sheaths, grease, tubes, centralizers and spacers, shall be of good quality, acceptable to the Engineer. The contractor shall submit Manufacturer's certificates and catalogs, test reports or other such documents, as required by the Engineer.

221.10.2-Work Plan, Slope Drape: Installation of rock bolts 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 rock bolt drilling methods and equipment, including drill hole diameter and length proposed to achieve the required pullout resistance.
4. 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.

5. Proposed rock bolt grout placement procedures and equipment.
6. Proposed rock bolt testing methods and equipment setup.
7. Identification number and certified calibration records for each test jack, pressure gauge and load cell to be used.

221.10.3-Installation:

211.10.3.1-General. Prepare a complete design for the rock bolts that conforms to the criteria on the Plans, Specifications, and other documents referenced therein. The design shall be based on the Contractor's experience on similar work and on accepted practice described in AASHTO LRFD Bridge Construction Specifications "Section 6: Ground Anchors". The design shall also include the corrosion protection scheme.

The Contractor is cautioned that the soil and rock information shown on the Plans is based on visual observation from ground level and aerial reconnaissance. The actual conditions and elevations may differ from those shown.

Any design different from that shown on the Plans shall be prepared and sealed by a duly licensed Professional Engineer in the state of West Virginia. The design and working drawings shall be reviewed by the Engineer to confirm that the design meets the design requirements.

The Contractor may use a nominal (ultimate) grout-rock bond stress higher than those recommended in the geotechnical report, provided that a field pullout test is performed by the Contractor to confirm the higher bond stress. The anchor to be pullout tested shall have a minimum bond length of 10 feet. The pullout test shall be done at no cost to the Department. If the Contractor chooses to use a higher bond stress, the Contractor will be responsible for failed performance tests and/or proof tests as a result of using a higher bond stress. The cost of installing and re-testing additional anchors will be the responsibility of the Contractor.

Anchor centerlines shall not deviate from their planned location by more than 3 degrees, nor shall they approach each other closer than 4 feet at their lower ends.

A resistance factor unit bond stress and a set of estimated required bonded lengths and corresponding grouted diameters are specified on the plans. Should the Contractor decide to use a different factored unit bond stress, he shall be responsible for determining the bond length necessary to develop adequate load capacity to satisfy anchor testing acceptance criteria for the design load. Any rock anchor that does not meet the test acceptance criteria shall be replaced at no additional cost to the Department.

The diameter of the drilled hole shall be adequate for grouting inside and outside the polypropylene tube. The hole shall be free of fall-in soil or other debris immediately prior to grouting.

211.10.3.2-Hole in the Stressing Length: Casing of portions of many or all holes may be needed to maintain an open clean hole. There will be no additional compensation for such casings: their cost shall be included in the bid prices.

211.10.3.3-Hole in the Bond Length: Drilling Logs shall be prepared in a manner approved by the Engineer, and submitted daily. They shall contain the following information:

1. Characteristics of all materials encountered during the drilling profess, and their specific locations within the holes

2. Location of special features such as mud seams, open cracks, broken rock, etc.
3. Points where abnormal loss or gain to drill water has occurred
4. Groundwater levels or other items of interest for grouting
5. All significant actions of the bit
6. If any weak material, such as coal, clay, weathered rock or the like is encountered within the required bond length, the hole shall be extended to compensate for the weak material
7. If large voids are encountered, consolidation grouting and re-drilling of the hole will be required. The grout shall be injected at the lowest point of the drill hole and shall proceed such that the hole is filled progressively from the bottom to the top, in order to prevent air voids.

Consolidation grout should have a water/cement ratio of between 0.45 and 0.55. Variations from these ratios shall require an approval from the Engineer prior to the placement. Special measures (such as stiff grout mixes) may be required to prevent or reduce grout loss. A consolidation-grouted hole shall not be re-drilled until the grout has had a minimum of 24 hours to set up.

211.10.3.4-Grouting: During grouting, the end of the grout pipe shall be covered by at least 2 feet of wet grout. Grouting shall proceed from the bottom up, to prevent air voids. The grout in the stressing length must not interfere with the stressing operation; tendons in the stressing length must not develop any bond to the surrounding grout. The achieve this, the grout inside the polypropylene tube shall preferably be placed after stressing.

The grout shall be placed over the entire bond length without interruption. The anchor shall then remain undisturbed until the grout has reached a minimum strength of 3,500 psi. The following data shall be recorded and submitted to the Engineer, about the grouting operation, on a daily basis:

1. Type of Mixer
2. Type of cement and water/cement ratio
3. Type of additives (if approved)
4. Grout pressure
5. Test sample strengths (prior to stressing)
6. Volume of grout placed in the bond and in the stressing lengths.

211.10.3.5-Corrosion Protection of Anchorage: Following acceptance of the rock bolt by the Engineer, the portion of each bolt extending past the lock-ff plate shall be cut off in a manner that will not develop excessive heat. The anchorage shall not be damaged by the cutting operation.

211.10.3.6-Rock Bolt Tests: In the following sections, AL denotes the alignment load (0.10P) and P denotes the anchor design load.

211.10.3.6.1-Performance Test: A performance test shall be carried out on a minimum of 5% of the rock bolts for each identified areas shown on the plans, and as directed by the Engineer. During the performance test, the contractor shall incrementally load and unload the rock bolt in accordance with the following schedule. The movement of the bolt shall be recorded to the nearest 0.001 inches at each increment, with respect to an independent

(fixed) reference point. The load applied by the jack shall be monitored with a pressure gauge and preferably a load cell.

Each load shall be held for a minimum of one minute with the maximum loading being held for 60 minutes.

All leaks in the jacking system shall be repaired as discovered and the test restarted at the initial reading.

Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6
AL	AL	AL	AL	AL	AL
0.25P	0.25P	0.25P	0.25P	0.25P	0.25P
	0.50P	0.50P	0.50P	0.50P	0.50P
	0.25P	0.75P	0.75P	0.75P	0.75P
		0.50P	1.00P	1.00P	1.00P
		0.25P	0.75P	1.20P	1.20P
			0.50P	1.00P	1.33P (Max)
			0.25P	0.75P	- hold for creep test
				0.50P	- reduce for lock off load, P
				0.25P	

All anchors undergoing performance tests shall hold the maximum load, i.e. 1.33P, for 10 minutes (or 60 minutes). The jack shall be repumped as necessary in order to maintain a constant load. During this period, the rock bolt movement with respect to a fixed reference point shall be recorded at 0 seconds, 30 seconds, 1 minute, 2,3,4,5,6, and 10 minutes (and 15, 20, 25, 30, 45, and 60 minutes). The dial gauge used for monitoring movement shall be capable of reading the entire movement with resetting. Upon passing the acceptance criteria, the anchor shall be adjusted to lock off load, P.

211.10.3.6.2-Lift Off Test: A lift-off test shall be part of the performance test. After transferring the load to the end anchorage, a lift-off reading shall be made. The load determined from the lift-off reading shall be within 5 percent of the desired transfer or lock-off load otherwise the end of the anchorage shall be reset to the design load and another lift-off reading shall be made.

Lift-off tests can me made a minimum of 24 hours, and a maximum of 7 days, after the design load has been locked off in the rock bolt. The results of the test shall be submitted to the Engineer on the day of the test. All tendons which are to be lift tested must have an adequate length of bolt protruding over the anchorage to permit jacking. The jack utilized for lift-ff testing shall be calibrated within two weeks of testing and at intervals of approximately 3 months throughout testing. The contractor shall furnish the calibration chart and submit it to the Engineer.

211.10.3.6.3-Proof Test: All rock bolts not performance tested shall be proof tested by incrementally loading the anchor in accordance with the following schedule. Load and movement shall be monitored as indicated above.

Load
AL
0.25P
0.50P
0.75P
1.00P
1.20P
1.33P (Max)
- Hold for Creep Test
- Reduce to lock-off load, P

The proof test results shall be compared to the performance test results. Any significant variation from the performance test results may require a performance test on the next anchor. Lift-off tests for proof tested anchors may be required as designated by the Engineer. The contractor shall do all additional tests due to inadequate results of a proof test at no cost to the Department

Upon passing the acceptance criteria, the rock bolt shall be adjusted to lock-off load,°P.

211.10.3.6.4-Acceptance Criteria: A performance-tested or proof-tested rock bolt with a 10-minute load hold shall be accepted if (1) the rock bolt resists the maximum test load with less than 0.04" of movement between 1 minute and 10 minutes; and (2) the total elastic movement at maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length; or (3) the total elastic movement at the maximum test load does not exceed the theoretical elastic elongation of the unbonded length plus 50% of the theoretical elongation of the bonded length.

A performance-tested or proof-tested rock bolt with a 60-minute load hold shall be accepted if (1) the rock bolt resists the maximum test load with a creep rate that does not exceed 0.08" in the last log cycle of time; and (2) the total elastic movement at maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.

The initial lift-off reading shall be within +5% of the design lock-off load. If the criterion is not met, the tendon load shall be adjusted accordingly and the initial lift-off reading repeated.

If any bolt fails to meet the acceptance criteria, the Contractor shall determine, if possible, the reason for failure. An additional bolt shall be installed in accordance with this specification at a location approved by the Engineer and tested to verify that the capacity of the new anchor meets the 1.33P load. The Department will make no payment for failed bolts. An additional bolt in this area shall be performance tested when a failure occurs, at no cost to the Department.

Records shall be kept of the load and elongation for each increment of loading for each tieback and shall be furnished to the Engineer following the completion of each test.

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.

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.

211.12.7-Localized Rock Bolting: Localized rock bolting will be measured and paid per rock bolt, complete in place and accepted. The price for the bolting shall include full compensation for all material, supervision, engineering, drawings and spare parts; plus labor, equipment, tools, and performance testing.

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
221014-001	Localized Rock Bolting	Each

“Height” = Barrier Height, in feet

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 601
STRUCTURAL CONCRETE

601.3–PROPORTIONING:

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

Design mixture testing for Class H concrete shall be in accordance with MP 711.03.23 and shall include air content, slump, compressive strength, rapid chloride permeability tests, and surface resistivity testing. For establishment of mixture proportions, rapid chloride permeability tests shall be made on representative samples prepared and tested in accordance with AASHTO T277. The rapid chloride permeability test specimens shall be tested at an age of 90 days (or at any time prior to 90 days), and the results of this test shall not exceed 750 coulombs. Specimens shall be moist cured for 56 days prior to the start of specimen preparation unless specimens are to be tested prior to 56 days, in which case the specimens shall be moist cured until the time of test. The 28-day compressive strength of the test mix that satisfies the 750 coulomb threshold shall be used as the basis for acceptance of Class H concrete per Section 601.4.5. For establishment of mixture proportions, surface resistivity testing shall be performed in accordance with AASHTO T 358. A set of three 4-inch x 8-inch ~~(100 mm x 200 mm)~~ cylinders shall be fabricated and moist cured, as specified in AASHTO R 39, for 28 days prior to testing. Surface resistivity test results shall be for information purposes only, but ideally, the average result of the three cylinders should not be less than ~~61~~ 40 kΩ-cm for 4-inch x 8-inch ~~(100 mm x 200 mm)~~ cylinders. The cost of all test mix requirements for new Class H mix designs shall be considered incidental to the cost of Class H concrete.

For existing Class H mix designs, which have already approved by the Division, surface resistivity testing shall be performed on a laboratory trial batch at a Division Approved Concrete Mix Design Laboratory. The cost of conducting this surface resistivity test shall be paid as a separate Pay Item.

601.4-TESTING:

601.4.1–Sampling and Testing Methods:

ADD THE FOLLOWING TO THE TABLE IN SUBSECTION 601.4.1:

Surface Resistivity	AASHTO T 358

601.4.5–Tests for Permeability Acceptance of Class H Concrete:

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

601.4.5–Tests for Permeability Acceptance and Surface Resistivity of Class H Concrete:

ADD THE FOLLOWING PARAGRAPH TO THE END OF THE SUBSECTION:

The Contractor shall also be required to fabricate and test three Surface Resistivity test specimens, in accordance with AASHTO ~~T23~~ R100 and AASHTO T358, every time that a set of compressive strength specimens for Class H concrete is fabricated. These test specimens shall be the same size as the Surface Resistivity test specimens that were tested in the approved mix design, and they shall be tested at an age of 28-days. These test specimens shall be moist cured, in the same manner as the Class H compressive strength specimens, until as close to the time of testing as possible. The average Surface Resistivity test result of these three test specimens shall be used for information purposes only. The 28-day Surface Resistivity result of each of these three specimens, the Project Number for which they were fabricated, and the approved mix design number which was used to batch the concrete shall be forwarded to the following e-mail address: DOHConcreteMixDesign@wv.gov as soon as testing is completed. Average Surface Resistivity results equal to or greater than ~~29~~ 30 kΩ-cm for 4-inch x 8-inch cylinders ~~(100 mm x 200 mm)~~ are considered acceptable.

601.16-PAY ITEMS:

ADD THE FOLLOWING PAY ITEM:

ITEM	DESCRIPTION	UNIT
601050-005	Surface Resistivity Testing of Existing Class H Concrete Mix Design	Each

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

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

401.13-BASIS OF PAYMENT:

401.13.2

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

~~**401.13.2** When a Lot of asphalt pavement is represented by a smoothness value larger than that shown in Tables 401.7.2E or 401.7.2M, the unit price of the Lot (surface course only) shall be determined as follows:~~

~~ENGLISH VERSION:~~

~~Reduced Unit Price~~	~~=~~	~~Unit Bid Price X [(127.86 – As)/100]~~
~~Where A~~	~~=~~	~~0.429 when specified smoothness is 65 in/mi~~
~~Where A~~	~~=~~	~~0.341 when specified smoothness is 81 in/mi~~
~~Where s~~	~~=~~	~~Smoothness value measured as per 401.7.2~~

~~METRIC VERSION:~~

~~Reduced Unit Price~~	~~=~~	~~Unit Bid Price X [(127 – As)/100]~~
~~Where A~~	~~=~~	~~0.0274 when specified smoothness is 1 000mm/km~~
~~Where A~~	~~=~~	~~0.0218 when specified smoothness is 1 250 mm/km~~
~~Where s~~	~~=~~	~~smoothness value measured as per 401.7.2~~

~~When the measured smoothness value exceeds the specified value by 50% or more, the Lot so measured shall be corrected, at the Contractor's expense, to comply with Tables 401.7.2E or Table 401.7.2M.~~

401.13.2-Blank

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

ADD THE FOLLOWING SECTION:

SECTION 403
CRACK SEALING IN ASPHALT PAVEMENT

403.1-DESCRIPTION:

The work shall consist of the cleaning, crack sealing, and crack filling in asphalt pavement in the manner and subject to the conditions and regulations prescribed.

403.2-MATERIALS:

The material shall be hot poured crack sealant and conform to the requirements of Section 708.3 of the Specifications. ~~As well as being~~ The material must be compatible with asphalt pavement recycling.

403.3-WEATHER RESTRICTIONS:

The sealant material shall not be applied when the weather is foggy, rainy or when the ambient and pavement temperatures are below 40° F.

403.4-CONSTRUCTION:

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

The heating kettle used for melting sealing materials shall be of the indirect heating or double boiler type, using oil as the heat transfer medium. It shall have a thermostatically controlled heat source, a built-in automatic agitator, and thermometers installed to indicate both the temperature of the melted sealing material and that of the oil bath. Other methods of indirect heating approved by the Engineer may be used. A positive means of controlling the temperature of the heat transfer at all points in the system shall be incorporated in the heater. Sealing material shall be uniformly heated until the pouring temperature recommended by the manufacturer is reached. Should the maximum pouring temperature recommended be exceeded, the material will be rejected. The material shall be poured as soon as possible after the pouring temperature is reached. Only sufficient material for the day's operation shall be heated each day.

403.4.2-Preparation of Joints and Cracks for Sealing: The cracks shall be thoroughly cleaned of all loose scale, dirt, dust, vegetation, or other foreign matter prior to placing hot poured crack sealant. This shall be accomplished by use of a hot air lance, and any other tools necessary to complete the work. The use of any tool which results in damage to the pavement is prohibited.

403.4.3-Equipment for Applying Sealer: The equipment used shall conform to the manufacturers recommendations and consist of heating units from which material may be discharged into the crack through the use of flexible lines and suitable shoes.

403.4.4-Placement Requirements: Any spillage of sealing material on pavements shall be immediately removed. A neat and workmanlike job will be required at all times. At no time shall sealing material be placed in a crack which is either dirty or wet. The crack shall be clean and surface dry at the time of placement. Work will be suspended when cracks are wet or damp and when the atmospheric temperature is below 40 degrees. The standard overband shall be 3" centered over the crack. After the sealant has cooled, settling shall not exceed 3/8" below the surface. Any damage to uncured sealant shall be repaired at the contractor's expense. Cracks wider than 1" and deeper than 3" shouldn't be sealed to avoid improper sealing. If no overlay work is being performed then no more than 25% of the surface area is to be crack sealed, due to danger of diminished skid resistance.

Spalling, adhesive failure, or cohesive failure within 96 hours of installation shall be replaced at no additional cost.

403.4.5-Equipment, Personnel, and Documentation Requirements: The Contractor (two (2) days prior to commencement of the project) shall submit to the Engineer a detailed list of all equipment to be used for crack sealing on the project. The Contractor shall also provide certification from the Sealing material manufacturer that the Contractor is qualified to apply the manufacturer's material in conformance with these specifications and the manufacture's recommendations.

The Contractor is responsible for quality control, and shall submit a quality control plan in accordance with these specifications to the Engineer at the Pre-Construction Conference.

403.5-METHOD OF MEASUREMENT:

The quantity of work done will be measured in linear feet of "Crack Sealing in Asphalt Pavement" applied and accepted.

403.6-BASIS OF PAYMENT:

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

403.7-PAY ITEM:

ITEM	DESCRIPTION	UNIT
403001-001	Crack Sealing in Asphalt Pavement	Linear Foot

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

SECTION 601
STRUCTURAL CONCRETE

601.1-DESCRIPTION:

ADD THE FOLLOWING TO THE END OF THE SECTION:

Fiber Reinforced Polymer (FRP) For Structural Repairs - This work shall consist of the repair or retrofit of concrete with an externally bonded, high-strength, Fiber Reinforced Polymer (FRP) composite wrap system in accordance with these specifications and in reasonably close conformity with the lines, grades, dimensions, and locations as shown on the Contract Plans or as established by the Engineer.

601.2-MATERIALS:

ADD THE FOLLOWING TO THE END OF THE SECTION:

Fiber Reinforced Polymer (FRP): All constituent materials of the FRP system (fabric, epoxy resin, primer, etc.) shall be supplied by a single FRP Manufacturer (mixing of materials from different manufacturers is not approved). All materials must be approved by the Department.

Provide a unidirectional, high-strength fiber fabric fully saturated with compatible epoxy resin per the manufacturer's recommendations. Use epoxy resin and FRP laminae in accordance with the latest edition of ACI 440.8 *Specification for Carbon and Glass Fiber-Reinforced Polymer Materials Made by Wet Layup for External Strengthening of Concrete and Masonry Structures.*

Polyester or vinyl ester resins are not allowed as a substitute for epoxy resin. Fiber may be either Carbon (CFRP) or E-Glass (EGFRP). Input fibers of FRP systems shall meet or exceed the following requirements:

Property	Carbon	E-Glass
Tensile Strength (ASTM D3039)	550 ksi	330 ksi
Tensile Modulus (ASTM D3039)	33,000 ksi	10,500 ksi
Ultimate Elongation (ASTM D3039)	1.50%	4.00%
Minimum dry fabric weight	9 oz/yd^2	27 oz/yd^2
Maximum dry fabric weight	18 oz/yd^2	27 oz/yd^2

601.4-TESTINGS:

ADD THE FOLLOWING TO THE END OF THE SECTION:

601.4.6-FRP Approvals: Working drawings shall be submitted to the Engineer for review and approval a minimum of thirty (30) working days prior to installation. The working drawings shall be signed and sealed by a Professional Engineer registered in the State of West Virginia. Working drawings shall include the type of FRP system, number of layers and orientation of all FRP materials, repair locations, relevant dimensions of the system and the work plan including the necessary preparations of the existing structure. The drawings must be accompanied by the design calculations, the Safety Data Sheet (SDS), and the manufacturer's system data sheet identifying mechanical, physical, and chemical properties of all components of the FRP system, and application guide including installation and maintenance procedures. The installation procedure must clearly identify any environmental and substrate conditions that may affect the application and curing of the FRP system. The design calculations shall provide the additional required structural strength shown in the contract plans and shall be performed in accordance with the latest edition ACI 440.2R *Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures*. The Contractor shall also submit a Quality Control Plan to the Engineer for review prior to securing materials and beginning of installation.

601.4.7-FRP Quality Control: Quality control is the responsibility of the Contractor. Quality control and assurance during installation of the FRP system components shall be described in a Quality Control Plan. The Quality Control Plan will include, but not limited to, the following:

1. Evidence that the Contractor has been trained to apply the FRP wrap material and can demonstrate experience in supplying the FRP system on projects similar in size and scope
2. Delivery, handling, and storage requirements for raw materials
3. Time schedule for various steps in the work
4. Procedures to inspect wrap during installation to ensure that it meets the manufacturer's instructions and those in the Contract Documents and these provisions
5. Inspection and quality standards for all completed work
6. Sampling plans
7. Test methods
8. Criteria for acceptance or rejection
9. Repair procedures for any defective work
10. Record keeping standards

11. All safety precautions for all FRP wrap system components, including containment, disposal, and cleanup

Any part of the work that fails to comply with the Contractor's approved Quality Control Plan, the Contract Documents, or these provisions may be rejected by the Engineer, and shall be remedied, or removed and replaced by the Contractor at no additional cost to the Department.

The Contractor shall have present prior to the start of the work and during the installation of the FRP system, a manufacturer's representative, knowledgeable in the methods of installation of the FRP system, for technical expertise and to verify the Contractor's personnel installing the system are knowledgeable and are installing the system's components in accordance with the manufacturer's recommendations. The Contactor shall also arrange to have the manufacturer's representative present during inspection and testing of the material. The manufacturer's representative shall certify that the system was properly installed at the completion of the installation prior to final payment to the Contractor.

Before applying the protective coating, the Contractor shall perform a direct pull-off test in the presence of the Engineer and manufacturer's representative following ASTM D7522 to verify the tensile bond between the FRP wrap system and the concrete substrate. At a minimum, perform three direct pull-off tests or one test per 1,000 square feet of the installed FRP wrap system, whichever is greater. Tension adhesion strengths should exceed 200 psi and exhibit failure of the concrete substrate. Tensile adhesion strengths exceeding 500 psi or exceeding the capacity of the testing apparatus shall also be deemed acceptable. A failure at the bond line with a tensile stress below 200 psi is unacceptable. If one or more of the pull-off tests is found unacceptable, perform two additional tests adjacent to the area where the unacceptable pull-off tests were located. If one of the additional pull-off tests is found unacceptable, the work will be rejected. At the discretion of the Engineer, pull-off tests may be performed at locations of similar substrate near the FRP installation area. The Contractor shall prepare test samples using identical application procedures at the same time that the project FRP is installed. Repair the damaged FRP and concrete at test areas using approved methods after testing is complete.

For structural strengthening applications, quality assurance witness samples shall be made by the Contractor during FRP wrap system installation to permit tensile testing of the cured laminate to verify the material properties. Witness samples are not required for non-structural or low strain applications. Witness samples shall be fabricated using the same fiber, saturating resins, equipment, and methods used in the installation of the FRP system. The sample(s) shall be at least 12"x12" and must be made of one or two plies. One witness sample per lot or batch of composite material or for every 5,000 square feet of material installed shall be provided to verify compliance with the specification requirements. Store witness samples in a dry location on site and allow the panels to cure under the same environmental conditions as the installed FRP system. Five tensile tests will be conducted on the sample(s) in accordance with ASTM D7565 to verify the as-built laminate matches the minimum specifications. Samples will be tested by the Department or an approved, experienced testing laboratory within five (5) business days following the cure period. The FRP wrap system may be considered deficient if the value for tensile force per unit width of two (2) or more of the five (5) valid test results is less than the value for the ultimate tensile strength per unit width as stated on the material data sheet. The FRP wrap system may be considered deficient if the calculated average chord tensile

stiffness per unit width from the five (5) coupons tested is less than 90% of the value for chord tensile stiffness per unit width as stated on the material data sheet. If tested samples do not meet the minimum specifications listed above, the Engineer will make a determination regarding the disposition of the affected element. Such determination may include complete removal and reapplication at no additional cost to the Department.

601.10-PLACING CONCRETE:

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

601.10-FRP CONSTRUCTION REQUIREMENTS:

Unless otherwise dictated by the FRP manufacturer's instructions, the following installation guidelines shall be followed for the FRP wrap system.

601.10.1-Examination:

1. Verify dimensions of concrete members to be strengthened with externally bonded FRP reinforcement.
2. Visually assess the member to be strengthened and all surfaces to receive the FRP system for conditions that may affect the installation. Report all areas exhibiting evidence of deterioration or distress to the Engineer prior to initiation of surface preparation of FRP installation.
3. Provide necessary pathways, scaffoldings, or other means of access to the repair areas for personnel (including Owner and Engineer representatives), equipment, and materials.
4. Make a record drawing, sketch, or photo of all obstructions including pipes, conduits, wiring, junction boxes, and other items that affect the installation of the FRP system to enable them to be removed, relocated, and subsequently reinstalled at no additional cost to the Department. The Engineer shall approve any removal or relocation of obstructions.
5. Provide all necessary equipment in clean and operating condition and in sufficient quantities to ensure continuous and uninterrupted FRP installation.

601.10.2-Substrate Repair:

1. Make all substrate concrete repairs in the area of the FRP wrap system in accordance with the Contract Documents. Repair of deteriorated concrete in these areas will be measured and paid for as indicated in the Contract Documents. Consult with manufacturer to determine the appropriate degree of curing and drying of repairs to which the FRP system will be bonded.
2. Inject all cracks in the surface of the concrete wider than 0.01-inch with epoxy resin under pressure in accordance with the manufacturer's recommendations.

601.10.3-Surface Preparation:

1. The concrete surface should be prepared to a minimum concrete surface profile (CSP) 3 as defined by the ICRI-surface-profile chips (ICRI 03732, NCHRP Report 609). All

irregularities, unevenness, and sharp protrusions in the surface profile shall be ground to a smooth surface with less than 1/32-inch deviation or the tolerances recommended by the FRP manufacturer.

2. Round or chamfer all inside and outside corners and sharp edges to where FRP is wrapped to a minimum radius of ½-inch. Grind ridges, form lines, and sharp or roughened edges greater than ¼-inch.
3. Clean concrete surfaces using methods recommended by the manufacturer to remove all laitance, dust, dirt, oil, curing compound, existing coatings, foreign particles, disintegrated materials, and any other matter that could interfere with the bond between the FRP and the concrete substrate using abrasive or water blasting techniques. If power wash is used, the surface shall be allowed to completely dry before installing the FRP wrap system. Protect the cleaned surface against redeposit of any bond-inhibiting materials.

601.10.4-Installation of FRP System:

1. Do not apply the FRP system or any of its constituent materials to frozen or wet surfaces. Do not apply FRP materials if rain, snow, or dew point condensation is expected.
2. Ensure ambient and concrete surface temperatures are within the range specified by the manufacturer for FRP installation. Contractor shall provide verification of the temperature and humidity at the application location prior to use.
3. Unless the resin has been specifically formulated for wet applications, do not install the FRP system when environmental conditions support moisture vapor transmission from the concrete substrate. If the resin is formulated for wet applications, ensure moisture levels on concrete substrate and moisture vapor transmission rates comply with manufacturer's recommendations.
4. Commencement of FRP installation will constitute acceptance of substrate conditions by the Contractor.
5. Mix all resin constituent materials in accordance with manufacturer's instructions. Follow manufacturer’s instructions regarding mix ratio, temperature range, paddle type, mix duration, etc. Do not dilute any resin constituent materials with any organic solvents or thinners. Discard any mixed resin that exceeds its pot life or shows signs of increased viscosity.
6. If required by the FRP system manufacturer, coat the concrete surface to receive the FRP system with a primer resin. Apply primer at a coverage rate such that it penetrates the pores of the concrete substrate but does not drip or run. Fill and smooth all voids or depressions with diameters larger than ½-inch or depths greater than ⅛-inch with a compatible putty resin. Do not apply the putty until the primer is tack-free, unless approved by the manufacturer. Fillers or other thickening agents may be added to the putty in accordance with the manufacturer’s instructions. Do not apply putty to a previously applied primer or putty coat if that coat has fully cured, unless first prepared per the manufacturer’s instructions.
7. Follow manufacturer’s recommended procedures for impregnating fiber sheets with saturating resin. Apply saturating resin using a medium nap roller or calibrated mechanical saturator. Do not apply saturating resin or impregnated fiber sheet to a previously applied resin coat if that coat has fully cured, unless prepared per the

manufacturer's instructions. Place fiber sheet onto substrate. Roll fiber sheets in the direction of the fibers to remove any entrapped air between the fiber sheets and concrete surface and to fully impregnate the fiber sheets with saturating resin. Achieve full contact with the concrete substrate during rolling. Do not roll unidirectional fiber sheets in the direction transverse to the fibers to avoid damaging the fibers.

8. Ensure FRP fibers are oriented as noted in the working drawings. Report any deviation in the alignment of fibers of more than 5° to the Engineer for acceptance/rejection.
9. For multi-ply installations, follow the manufacturer's recommended procedures for installing multiple fiber sheet plies and the working drawings for the orientation of the fibers, ply stacking sequence, and length. Limit the number of plies applied in a single day to that which can be supported by the previously applied system without sloughing or sliding. Consult with the manufacturer to determine the maximum number of plies that can be applied in a single day considering temperature and other variables. Do not apply additional fiber sheet plies to previously cured plies unless first prepared per the manufacturer's instructions. Apply an additional coat of saturating resin if required by the manufacturer.
10. Provide lap splices equal to or exceeding the length recommended by the manufacturer such that the full tensile strength of the fiber sheet is achieved. Stagger lap splices for multiple plies or side-by-side installations.
11. Apply a final coat of thickened epoxy. Detail all fabric edges, including butt splice, termination points, and jacket edges, with epoxy.
12. Follow curing procedures in accordance with the manufacturer's recommendations. The FRP wrap system shall be protected from weather, large temperature variations, moisture, sand, dust, and other foreign particles during curing.
13. Apply protective coating meeting the requirements of 601.10.1 between 24 and 72 hours after final application of epoxy. Use paints that allow vapor transmission at gaps. Remove dust and residue prior to application of paint coats. If after 72 hours the epoxy is cured, the surface must be roughened by sanding or brush blasting.

After at least 24-hours for initial cure of the resin and before protective coatings are applied, the Contractor, in the presence of the Engineer and manufacturer's representative, will perform a visual and acoustic sounding inspection of the FRP surface for any swelling, bubbles, voids, delaminations, external cracks, chips, cuts, loose fibers, external abrasions, blemishes, foreign inclusions, depressible raised areas, or fabric wrinkles. Conduct acoustic tap testing at a frequency of one tap per 0.5 square feet. If any defects are found, they must be repaired according to manufacturer's instructions and the satisfaction of the Engineer or removed and replaced. Defects smaller than 2 square inches in area will require no corrective action, unless they occur next to edges, or the delaminated area exceeds 5% of the total laminate area or there are more than 10 such defects in an area of 10 square feet. Repair defects larger than 2 square inches. Defects will be addressed as follows:

1. **Epoxy Injection of Minor Defects -** Repair small defects between 2 square inches and 25 square inches using low-pressure epoxy injection, as long as the defect is local and does not extend through the complete thickness of the laminate in the case of multi-ply FRP wrap systems. Two small holes may be drilled into the delamination to facilitate injection of the epoxy and escape of entrapped air.

2. **Localized Replacement of Large Defects -** For defects larger than 25 square inches or where deemed necessary by the Engineer, mark the defect and remove the entire thickness of the defect to a minimum of 1-inch beyond the defect limit on all sides. Prepare the concrete substrate and apply the FRP system in accordance with the manufacturer's recommendations. Extend the additional FRP layers a minimum of 6 inches on all sides of the defect repair or greater as recommended by the manufacturer. Do not apply additional fiber sheet plies to previously cured plies unless first prepared per the manufacturer's instructions.

Repairs and filling of voids is required for completion of the work and will be at no additional cost to the Department.

601.10.1-Coating System Application Notes: After the final wrap layer is completely cured, apply a flexible, waterproofing, non-vapor barrier protective top coating. The coating may be a polymer-modified Portland cement coating or a polymer-based latex coating compatible with the FRP manufacturer's recommendations to protect FRP from ultraviolet radiation and mild abrasion. Match the color and texture of the protective top coating to adjacent bare concrete or concrete protective coating.

601.14-METHOD OF MEASUREMENT:

ADD THE FOLLOWING TO THE END OF THE SECTION:

The measurement for payment for Item 601015-005, FRP Wrap System, will be based on the actual surface area in square feet as determined from the lines and dimensions shown on the plans, subject to field verification. No extra measurement or payment will be made for overlap areas or multiple layers.

601.15-BASIS OF PAYMENT:

ADD THE FOLLOWING TO THE END OF THE SECTION:

The quantity, determined as provided above, will be paid for at the contract unit price bid for this item, which price and payment shall be full compensation for design and preparation of working drawings and Quality Control Plan, and all labor, tools, materials, equipment, storage, supplies, witness samples, testing, and incidentals necessary to complete the FRP installation as identified in this Special Provision and the Contract Documents. Payment shall include multiple ply wraps and all means of access required to place material (lifts, etc.) and provide inspection access to the Department.

601.16-PAY ITEMS:

ADD THE FOLLOWING ITEM TO THE TABLE:

ITEM	DESCRIPTION	UNIT
601015-005	FRP Wrap System	Square Feet (Meter)

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 602
REINFORCING STEEL

602.1-DESCRIPTION:

This work shall consist of furnishing and placing galvanized, epoxy coated, or uncoated reinforcing steel or corrosion resistant reinforcement in accordance with these Specifications and in reasonably close conformity with the Plans.

602.2-MATERIALS:

~~Reinforcing steel bars and welded wire reinforcement, epoxy coated or plain shall meet the requirements of 709.1 and 709.4.~~

~~Corrosion resistant reinforcing steel bars shall meet the requirements of 709.1.1 for stainless reinforcement and 709.1.2 for high chromium reinforcement respectively. The degree of corrosion resistance for reinforcement shall be specified in the plans.~~

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

MATERIAL	SUBSECTION
Corrosion Resistant Reinforcing Steel Bar, Stainless*	709.1.1
Corrosion Resistant Reinforcing Steel Bar, High Chromium*	709.1.2
Epoxy Coated Reinforcing Steel	709.1.4
Galvanized Reinforcing Steel	709.1.3
Reinforcing Steel Bar	709.1
Welded Wire Fabric Reinforcement	709.4

* The degree of corrosion resistance will be specified in the plans.

CONSTRUCTION METHODS

602.3-ORDER LISTS:

All order lists and bending diagrams shall be furnished by the Contractor. If requested by the Engineer, order lists and bending diagrams shall be submitted for approval. Approval of order

lists and bending diagrams by the Engineer shall in no way relieve the Contractor of responsibility for the correctness of such lists and diagrams.

602.4-PROTECTION OF MATERIALS:

Steel reinforcement shall be stored above the well-drained surface of the ground upon platforms, skids, or other supports and shall be protected from mechanical injury. Reinforcement shall be free from injurious defects such as cracks and laminations. Any loose scale, loose rust, dirt, paint, grease, oil or other foreign materials present on the reinforcement shall be removed by wire brushing, sand blasting or other approved methods before the placement of concrete.

Reinforcing steel which will be exposed over the winter shall be protected, within one week after the placing of the initial concrete, with a brush coat of neat cement, mixed with water to a consistency of thick paint. This coating shall be removed by lightly tapping with a hammer or other tool not more than one week before the placing of the adjacent pour.

602.5-BENDING OF REINFORCING BARS:

Unless otherwise permitted, all reinforcing bars shall be cold bent in the shop. Bars partially embedded in concrete shall not be field bent except when shown on the Plans or permitted by the Engineer. Only competent men shall be employed for cutting and bending, and proper appliances shall be provided for the work.

Bending shall be in accordance with the Manual of Standard Practice for Detailing, Reinforced Concrete Structures, ACI 315, latest revision. Rail-steel bars shall not be field bent or straightened.

Unless otherwise specified in the plans, bending of all corrosion-resistant reinforcing bars shall be per requirements of ~~with~~ the latest edition of the AASHTO LRFD Bridge Design Specifications.

602.6-PLACING AND FASTENING:

602.6.1-General: All reinforcing steel shall be accurately placed and, during the placing of concrete, firmly held by supports in the position shown on the Plans. Reinforcing bars shall be securely fastened together. Bars shall be tied at all intersections except where spacing is less than 1 feet (300 mm) in each direction, in which case alternate intersections shall be tied. Distance from the forms shall be maintained by means of stays, blocks, ties, hangers, chairs, or other approved supports. Blocks for holding reinforcement from contact with forms shall be precast mortar blocks of approved shape and dimension; the use of pebbles, broken stone, metal pipe or wooden blocks will not be permitted. Reinforcement in any member will be inspected and approved before any concrete is placed.

The clear distance between the reinforcing steel and the face of the concrete unless otherwise shown in the plans shall be:

Top of deck slab:	2.5”
Bottom of deck slab:	1.0”
Bottom of footings:	3.0”
All other locations:	2.0”

602.6.2-Epoxy Coated Bars: Epoxy coated bars shall be placed on plastic coated wire supports. Supports shall be installed in a manner to prevent planes of weakness in the hardened

concrete. The reinforcing steel shall be held in place by use of plastic or plastic coated tie wires especially fabricated for this purpose.

Any visible damage to the epoxy coating of the reinforcing steel that occurs during shipment, storage and installation of the steel shall be repaired. The ~~patching~~ Supplier shall furnish epoxy patching material to the project with the first shipment of epoxy coated steel. The patching material shall be prequalified as required for the coating material and shall be either identified on the container as meeting the requirements of ~~AASHTO M284, Annex A~~ ASTM A775 or shall be accompanied by a Certificate of compliance. ~~Patching~~ Repair of damaged areas shall be performed ~~in accordance with the patching material manufacturer's recommendations~~ per 709.1.4.

In the event it is anticipated that the epoxy bars will be stored on the project site, and/or placed in final position without the concrete cover for a period of 90 days or more, then the bars shall be stored in a temporary shed or covered with plastic to prevent damage to the epoxy coating due to ultra-violet rays or other atmospheric conditions. Any temporary storage means used, shall provide adequate ventilation to the bars to prevent the build-up of moisture on the bar surface.

602.6.3-Galvanized Coated Bars: Galvanized coated bars shall be placed on wire bar supports that are hot-dip galvanized, coated with epoxy or another polymer, or on supports made of plastic. Supports shall be installed in a manner to prevent planes of weakness in the hardened concrete. Galvanized reinforcing steel shall be held in place by use of zinc or polymer coated tie wire especially fabricated for this purpose.

Any visible damage to the galvanized coating of the reinforcing steel that occurs during shipment, storage and installation of the steel shall be repaired. If the extent of damaged coating does not exceed 2% of the surface area in any 1-foot length, all damaged coating discernible to a person with normal or corrected vision shall be repaired with a zinc-rich formulation in accordance with ASTM A780. If galvanized reinforcing bars are cut in the field, the bar ends shall be coated with a zinc-rich formulation in accordance with ASTM A780. The reinforcing bar Supplier shall furnish zinc-rich paint meeting the requirements of ASTM A780 to the project with the first shipment of galvanized coated steel. The repair material shall be prequalified and shall be either identified on the container as meeting the requirements of ASTM A780 or shall be accompanied by a Certificate of Compliance. Repair of damaged areas shall be performed in accordance with the repair material manufacturer's recommendations.

In the event it is anticipated that the galvanized bars will be stored on the project site, and/or placed in final position without the concrete cover for a period of 90 days or more, then the bars shall be stored in a clean and dry environment to prevent damage to the galvanized coating due to atmospheric conditions. Any temporary storage means used, shall provide adequate ventilation to the bars to prevent the build-up of moisture on the bar surface.

602.7-BAR SPLICES:

602.7.1-Lapping: All reinforcement shall be furnished in full lengths as indicated on the Plans. No splicing of bars, except where shown on the Plans, will be permitted without the written approval of the Engineer. Lapped splices shall be well distributed or located at points

of low tensile stress. The bars shall be rigidly clamped or wired at all splices in a manner approved by the Engineer. Minimum lengths of lap splices unless otherwise noted shall be:

Bar Designation	Min. Lap Splice (Ft)
#4 Bar	1'-9"
#5 Bar	2'-2"
#6 Bar	2'-9"
#7 Bar	3'-9"
#8 Bar	4'-11"
#9 Bar	6'-2"
#10 Bar	7'-10"
#11 Bar	9'-7"

For epoxy coated bars, the minimum lap splice length shall be increased by 50 percent at locations where concrete cover is less than 3 bar diameters and 20 percent at all other locations.

Lapped splices for corrosion-resistant rebar shall be in accordance with the latest edition of the AASHTO LRFD Bridge Design Specifications.

602.7.2-Welding: Splicing by welding of reinforcement will be permitted only if detailed on the Plans or if authorized by the Engineer in writing. Welding shall comply with the current specifications of the American Welding Society, D-1.4, and the weld shall develop an ultimate strength equal to or greater than that of the bars connected. Welding of corrosion resistant reinforcement is not permitted.

602.7.3-Mechanical Splice Connectors: Mechanical splice connectors shall develop in tension or compression at least 125 percent of the specified yield strength of the bar.

~~**602.8 FABRIC REINFORCEMENT:**~~

~~Mesh sheets or uncoated reinforcing steel, except steel mesh, will be measured by the pound (kg), based on Plan lengths and numbers of bars, using the unit weights in Table 602.9. The quantity for payment will be the number of pounds (kg) calculated and placed as shown on the Plans or directed, complete in place and accepted, subject to adjustment as provided for in 104.2 and 109.2.~~

~~602.9~~ 602.8 METHOD OF MEASUREMENT:

Galvanized, ~~E~~epoxy ~~-~~coated or uncoated reinforcing steel or corrosion resistant reinforcement, ~~except steel mesh,~~ will be measured by the pound ~~(kg)~~, based on Plan lengths and numbers of bars, using the unit weights in Table ~~602.9~~ 602.8. The quantity for payment will be the number of pounds ~~(kg)~~ calculated and placed as shown on the Plans or directed, complete in place and accepted, subject to adjustment as provided for in 104.2 and 109.2.

TABLE ~~602.9~~ 602.8

Bar Designation	Weight Per Lin. Ft. in Lb. ~~(Mass kg per meter)~~	Bar Designation	Weight Per Lin Ft. in Lb. ~~(Mass kg per meter)~~
# 3 ~~(10)~~	0.376 ~~(.560)~~	# 9 ~~(29)~~	3.400 ~~(5.060)~~
# 4 ~~(13)~~	0.668 ~~(.994)~~	# 10 ~~(32)~~	4.303 ~~(6.404)~~
# 5 ~~(16)~~	1.043 ~~(1.552)~~	# 11 ~~(36)~~	5.313 ~~(7.907)~~
# 6 ~~(19)~~	1.502 ~~(2.235)~~	# 14S ~~(43)~~	7.650 ~~(11.38)~~
# 7 ~~(22)~~	2.044 ~~(3.042)~~	# 18S ~~(57)~~	13.600 ~~(20.24)~~
# 8 ~~(25)~~	2.670 ~~(3.973)~~		

~~602.10~~ 602.9 BASIS OF PAYMENT:

The quantity, determined as provided above, will be paid for at the contract unit price bid for the items listed below, which price and payment shall be full compensation for furnishing, fabricating, transporting, storing and placing galvanized, epoxy coated, or uncoated reinforcing steel; and the furnishing of all other materials and doing all the work described in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

~~602.11~~ 602.10 PAY ITEMS:

ITEM	DESCRIPTION	UNIT
602001-*	Reinforcing Steel Bar	Pound ~~(Kilogram)~~
602002-*	Epoxy Coated Reinforcing Steel Bar	Pound ~~(Kilogram)~~
602003-*	Corrosion Resistant Reinforcing Steel Bar, "type"	Pound
602004-*	Galvanized Reinforcing Steel	Pound

* Sequence number

"type" shall either be stainless or high chromium

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 625
ROCK SOCKETED DRILLED SHAFT

625.1-DESCRIPTION:

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

625.2-SUBMITTALS:

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

625.2.1-Experience:

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

and removal, slurry placement, and any other work required to complete the rock socketed drilled shaft, shall be performed by the approved contractor or specialty subcontractor.

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

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

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

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

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

625.3: Blank

625.4-DIMENSIONAL REQUIREMENTS:

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

625.5-MATERIALS:

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

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

For placement of concrete by tremie or pumping, the cement factor shall be increased by 94 lbs. from the original design cement factor, the slump shall be 8 inches plus-or-minus 1 inch and shall maintain a slump in excess of 4 inches throughout the concrete placement.

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

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

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

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

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

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

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

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

a. Contractor shall provide suitable access to the "Preinstallation Core Hole" location at each rock socketed drilled shaft.
b. Drilling of a "Preinstallation Core Hole" will be performed by the Division* as specified in 625.7.2.1.
c. Drilling of cased hole through the soil overburden down to top of competent rock. Seating bottom of casing to minimize entry of ground water.
d. Drilling of rock socket to the minimum diameter shown in the plans and to an elevation shown on the drawings or otherwise directed by the Engineer.
e. Determination of wet or dry hole condition, by the Division*, as specified in 625.7.2.2.
f. Inspection of drilled hole for plumbness, by the Division*, as specified in 625.7.2.3.

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

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

625.6.1-Excavation:

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

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

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

The top elevation of competent rock must be confirmed as the socket drilling is started. The effective "top elevation" is based on observation of the boundary zone where broken or weathered rock becomes competent rock and is also influenced by the presence of any

shale or coal seams. Based on that elevation, and the information from the preinstallation core hole, the Engineer will determine the final depth of socket and bottom elevation.

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

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

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

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

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

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

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

a. Any required equipment within an excavation shall be operated by air or electricity. The use of gasoline-driven engines or diesel engines within an excavation will not be permitted. All lighting shall be electric, and precautions shall be taken regarding potential short circuits of electric current within ground water.

b. The Contractor will take precautions to assure that no explosive or noxious gases are present. Fresh air shall be supplied into the excavation and foul air shall be removed whenever any personnel are present in the hole.
c. A safety harness or chair lift, with separate safety line, protective cage, and two-way radio communication shall be used for any entry into an excavation.
d. No open excavation shall be left unattended. During non-working hours excavations shall be protected using solid, safe covers that are firmly fastened in place.

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

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

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

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

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

Prior to placing the reinforcement cage, the Contractor shall demonstrate to the satisfaction of the Engineer that the fabrication and handling methods to be used will result in a reinforcing cage

placed in the proper position, with the proper clearances, and without permanent bending or racking of the reinforcement cage.

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

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

TABLE 625.6.2.1

Drilled shaft Diameter	Number of CSL Tubes	Number of TIP wires	Tube / Wire Spacing
Less than 42”	3	0	120º
42” to ≤ 60”	4	0	90º
> 60” to ≤ 96”	6	6	60º
Greater than 96”	8	8	45º

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

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

The tubes shall be as near to parallel as possible. They shall extend from 6 inches above the drilled shaft bottom to at least 40 inches above the drilled shaft top. No tube may be allowed to rest on the bottom of a drilled excavation. If the drilled shaft top is sub-surface, then the tubes shall extend at least 2 feet above the ground surface or above the water surface if the ground surface is below water. Any joints required to achieve full length tubes shall be made watertight. The Contractor shall investigate all CSL tubes, making sure that there are no bends, crimps, obstructions or other impediments to the free passage of the testing probes. A record of the tube lengths, including a note of the projection of the tubes above the top of the shaft shall be made. The Contractor shall provide information on the shaft bottom and top elevations, length and construction dates to the Engineer prior to the CSL tests. Care shall be taken during placement of the reinforcing steel cage so as not to damage the tubes.

After placement of the cage, and before placement of concrete, the tubes shall be filled with clean water and the tube tops shall be capped or sealed to keep debris or other foreign

matter out of the tubes. Care shall be exercised in the removal of caps or plugs so as not to apply excess torque, hammering, or other stresses that could break the bond between the tubes and the concrete.

The TIP wires shall be per 625.5.5.

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

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

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

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

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

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

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

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

625.7-INSPECTION OF SOCKETS:

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

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

625.7.2-Division Testing:

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

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

Unless otherwise directed, the preinstallation test borings are to be extended a minimum depth of 2 upper drilled shaft diameters but not less than 10 feet below the planned tip elevation of the rock socketed drilled shaft shown on the plans. Standard Penetration Testing (SPT) and sampling shall be performed at 5-foot intervals in the preinstallation borings in accordance with AASHTO T 206. Rock coring will be performed in accordance with ASTM D2113 using a wireline core barrel system and will commence immediately upon obtaining an SPT value of 50 blows per 6-inches or less on bedrock. The recovered core sample size will be approximately 2-inch diameter (NX or NQ size). Additional preinstallation test borings in other locations may be required where directed by the Engineer.

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

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

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

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

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

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

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

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

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

625.7.2.5-Shaft Bottom Cleanliness: Contractor shall provide notice to the ~~MCS&T~~ Technical Support Division via e-mail ~~(DOHMCSnTcaisson@wv.gov)~~ (DOHDrilledShafts@wv.gov) 5 working days prior to the date each drilled shaft will be ready for inspection.

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

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

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

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

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

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

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

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

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

TABLE 625.7.2.6.1.2

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

Flaw or defect zones as indicated in Table 625.7.2.6.1.2 will be indicated on the logs and listed in a table within the report. The flaw or defect zones and their horizontal and vertical extent will be discussed in the report text. Flaws will be addressed by the Division if they affect more than 50% of the tested tube pairs at the same depth. Defects will be

addressed by the Division if they affect two or more of the tested tube pairs at the same depth. At a minimum, addressing flaws and defects will include Crosshole Tomography (CT). If it is determined that the rating is less than Questionable, based on the results of the CSL and CT testing, the Division will require core drilling and sampling by the Contractor for further evaluation of the flaw or defect at no additional cost to the Division. The diameter, number, depth, and location of cores shall be as directed by the Engineer.

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

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

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

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

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

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

When a tested shaft is categorized as anomaly (a), slices modeled at the area of question may be provided so that a structural evaluation of the shaft can be performed prior to implementing any corrective measures. Core drilling shall be performed to investigate problem areas found during TIP testing.

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

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

625.8-METHOD OF MEASUREMENT:

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

625.9-BASIS OF PAYMENT:

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

625.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
625001-*	Drilled shaft “D” Diameter	Linear Foot
625003-*	“D” Rock Socket	Linear Foot

* Sequence number

D = Diameter of shaft, in inches

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

STATE PROJECT NUMBER: _____

FEDERAL PROJECT NUMBER: _____

ADD THE FOLLOWING:

SECTION 628
EXPLORATORY DRILLING AND SAMPLING

628.1-DESCRIPTION:

This work shall include exploratory drilling at locations designated in the plans, or as directed by the Engineer. The exploratory drilling work shall be performed after the excavation to highway grade is completed.

628.2-EQUIPMENT:

All equipment and tools shall be subject to the approval of the Engineer. They shall be modern, in condition of good repair, and capable of doing the work herein described.

628.3-EXPLORATORY DRILLING:

628.3.1-Drilling:

628.3.1-Core Borings: Those borings designated core boring in these specifications shall include investigation of both the soil and rock portions within a specified boring and shall be accomplished as follows:

628.3.1.1-Soil Portion: Soil borings shall be made for the purpose of ascertaining the nature and elevation of each stratum of material encountered above rock. Test samples shall be collected as outlined in AASHTO Designation T-206. Unless otherwise specified or directed, sampling will be of the Standard Penetration Test (SPT) method. The soil boring may be advanced by Rotary Drill. If required to maintain an open hole and facilitate sampling, Rotary Drill - Mud Method or Rotary Drill - Cased Boring Method, which are described below, may be used:

a) Rotary Drill - Mud Method: Any method which demonstrates to the satisfaction of the Engineer successful advancement of the boring maintaining an open hole and permitting the securing of disturbed and undisturbed samples, and SPT blow counts shall be permitted. The method described in Bulletin 35, Waterways Experiment

Station, Corps of Engineers, U.S. Army, Vicksburg, Mississippi, is a satisfactory method.

b) Rotary Drill - Cased Boring Method: This method shall be considered satisfactory for advancing the boring, maintaining an open hole and securing disturbed and undisturbed samples, and SPT blow counts. The hole shall be advanced by driving steel casing of such inside diameter to accommodate the sampling equipment herein described. The casing shall be driven without the use of wash water, but the soil within the casing may be removed by wash method to the depth at which a sample is to be taken. The contractor shall maintain a clean hole when performing Standard Penetration Testing. This shall be accomplished by augering with a center head assembly inside of the hollow stem auger or other proven method to prevent cuttings from entering the hollow stem auger that will affect the SPT sampling.

628.3.1.2-Rock Portion: When rock is encountered within the specified boring depth, core drilling shall be accomplished in accordance with AASHTO T-225 except that only drills with hydraulically or mechanically activated feeds or thrusts will be permitted and only double tube core barrels will be allowed. Only NX size core shall be recovered unless otherwise stated or by approval of the Engineer.

a) Determination of Top of Rock: Unless otherwise specified by the Engineer, Standard Penetration Testing shall be performed at five (5) foot intervals until a blow count of 25 over six (6) inches of penetration is obtained, and the sample displays rock-like structure. This material is defined as Intermediate Geo Material (IGM) and shall be treated as rock.

b) Sampling of IGM: Standard Penetration Testing shall be performed on 2.5-foot interval once an IGM is encountered until or a blow count of 50 over six (6) inches is obtained. Once 50 over six (6) inches of penetrations is obtained, the Contactor shall attempt rock coring; provided the rock is suitable to be cored. In any event, rock coring shall commence at 50 over three (3) inches. It is the intent of this specification to obtain samples by core drilling at the earliest opportunity after encountering IGM. Advancing much of a five (5) foot auger for placement of its top near the ground surface is not acceptable. Use of a short auger section will sometimes be required to satisfy this requirement.

c) Encountering Boulders/Cobbles: Where boulders and/or cobbles are encountered the Contractor may believe that the top of rock has been reached. Once penetrating the encountered boulder/cobble with the appropriate core barrel, the contractor will again encounter unconsolidated material. The Contractor, under these circumstances, shall ream the borehole, or advance the borings by other means acceptable to the Engineer, to continue downward once again utilizing the Standard Penetration Testing method. This method shall be employed until bedrock is encountered at which time rock coring shall commence.

628.3.2-Water Level Measurements: The Contractor shall take water level measurements, measured from the ground surface, during the drilling operation at the following intervals:

1. During augering through the overburden soils when there is an indication that a water table has been encountered (i.e. saturated split spoon samples, water coming out of the auger hole with cuttings, water marks on the drill rods or split spoons, etc.) A

water level measurement taken during augering through the overburden soil, and before water is introduced into the drill hole, shall be termed "Immediate" and recorded on the boring logs.

2. At the completion of auger advancement and prior to beginning coring operations. A water level measurement shall be attempted before introducing water into the hole for core drilling. A water level measurement taken at the completion of augering and prior to coring shall be termed "Before Coring" and recorded on the boring logs.
3. Immediately after the completion of drilling and prior to removal of the hollow stem augers from the hole. A water level measurement shall be taken at this time. A water level measurement taken at this time shall be termed "At Completion" and recorded on the boring logs.
4. At some time period after the "At Completion" water level measurement is taken (typically 24 hours). If the Contractor has been instructed to backfill the core hole immediately by the Engineer and cannot leave the core hole open due to safety or environmental reasons, or the core hole caves in, then no measurement will be required at this time. A water level measurement taken at this time, if taken, shall be termed "After 'X' Hours" and recorded on the boring logs.

628.3.2-Sample Collection & Preparation:

628.3.2.1-Sample Types: The following listed sample types may be required. Each sample shall be clearly and permanently identified by project number, boring number (or station and offset for sample that would otherwise lack reference to its location), sample depth, and date material is sampled. Facilities for temporary storage of samples shall be provided by the Contractor. All samples will be kept from freezing until the Engineer has observed and evaluated the sample. Under no circumstances will samples selected for testing be permitted to freeze.

a) Thin Wall Tube Samples: Thin wall tube samples with a minimum diameter of 3 inches shall be recovered at the locations and depths indicated in the contract documents or as directed by the Engineer. Advancement of the boring to the elevation at which the sample is to be taken will be by the rotary drill – cased boring method as previously described herein. The apparatus, collection, and preparation of the sample shall be in accordance with AASHTO Designation T-207.

b) Standard Penetration Test & Split-Barrel Samples: Standard penetration samples required in the normal advancement of borings Engineer shall be obtained in accordance with AASHTO Designation T-206. Representative samples of material shall be placed immediately in tightly capped glass jars. The jars will be of a size which can be stored in standard core boxes (approximately 2.5 inches by 5 inches). The jar samples shall be properly identified and boxed in core boxes or containers with individual jar compartments.

c) Rock Core Samples: When rock is encountered, a continuous core of rock shall be recovered to the depth specified or directed by the Engineer. When a rock core is to be retained for reasons other than photographing as directed by the Engineer, the contractor shall provide wooden or other durable material boxes to retain the core in the manner described in AASHTO Designation T-225. Rock core from more than one boring shall not be packed in a single box. The boxes shall have approximate inside dimensions of 48 inches by 12 inches by 2.5 inches. All core boxes for structure borings shall be provided for the use of the Engineer for the purpose of

photographing the cores.

d) Bag Samples: At locations indicated in these specifications or as directed by the Engineer, bag samples will be required. These samples shall be placed in a tightly woven plastic lined cloth bag with identifying sample sheets placed inside the bag and attached to the outside. In addition, for field moisture determination, a small sample bearing the same identification shall be placed in a taped Zip Loc® bag and included inside the bag. The quantity required per bag sample shall be not less than 40 lbs. For samples to be taken in water, the samples are to be obtained utilizing a hand bucket auger or other device approved by the Engineer.

628.3.3-Reporting:

628.3.3.1-Boring Log: Within 72 hours after completion of a boring, one copy of the field boring log exactly as recorded by the driller shall be submitted to the office of the Engineer. The driller's log shall contain the following information:

1. Heading: The heading of each boring log shall containthe following information:
   a. Project number and common name, as designated on the location plan.
   b. Boring number, if applicable, as designated on the location plan.
   c. Location, referenced to centerline of survey stationing, and offset measured to the nearest foot.
   d. Method of drilling and sampling employed.
   e. Diameter of borings.
   f. Date of start and date of completion of borings.
   g. Name of driller.
   h. Ground surface elevation of boring. Elevation of top of water and stream bed in water borings.
   i. Sheet number and total number of log sheets for each boring.
2. Sub-Surface Conditions: The boring log of subsurface conditions encountered and samples secured shall includethe following:
   a. Depth of layer boundaries.
   b. A description of each layer encountered in the following order: color, material description, minor constituents, grain size, structure, weathering, moisture, and stiffness/hardness as applicable.
   c. Field number of each sample taken and depth at which taken.
   d. Depth of water observed in the boring.
   e. Depth at which obstacles were encountered in advancing the boring; such as boulders, metal, or caving material.
   f. Number of blows required to drive casing per foot where applicable.
   g. Depth to which casing was driven or installed.
   h. Length of drive for soil samples and length of sample recovered.
   i. Number of blows required to drive sampler when Standard Penetration Test is used and hammer type. (automatic or cathead and rope).
   j. Length of each run for rock core and footage of core recovered by each run.
   k. Record of color of drilling fluid and type of cuttings flushed to surface in advancing the boring.
   l. Interval or depth where drilling fluid returned, or circulation was lost.
   m. Record of changes occurring in rate of advance of bit when coring rock.
   n. Thickness of sod cover to nearest 0.1 foot and depth of humus or surface soil

zone to nearest 0.1 foot.

o. Reason for abandoning the boring if specified depth was not reached.
p. Any unusual conditions encountered in advancing the boring and in sampling.
q. Rock Quality Designation (RQD) - The RQD percentage is to be recorded for each core run. RQD is defined as the total length of recovered core pieces 4 inches or greater in length expressed as a percentage of the core run. Generally, RQD should be based on consistent 5 foot or 10-foot core runs.
r. Hardness And (Estimated) Compressive Strength Index of The Rock (HCSI) - The HCSI of the rock will be indicated by a number (0 through 6). The HCSI number will be recorded for each change in bedrock hardness. The determination of this number will be in accordance with the following table:

Hardness and (Estimated) Unconfined Compressive Strength Index (HCSI)

INDEX	HARDNESS	FIELD IDENTIFICATION	TONS/FT^2	psi
0	Extremely Soft Rock	Indented by Thumb Nail	2.0-7.0	28-100
1	Very Soft Rock	Crumble under firm blows with point of geological pick. Can be peeled by a pocket knife.	7.0-70	100-1,000
2	Soft Rock	Can be peeled by a pocket knife with difficulty. Shallow indentations made by firm blow with point of geological hammer.	70-280	1,000-4,000
3	Mediumhard Rock	Cannot be scraped or peeled with a pocket knife. Specimen can be fractured with single firm blow of hammer end of geological pick.	280-560	4,000-8,000
4	Hard Rock	Specimen requires more than one blow with hammer end of geological pick to fracture it.	560-1120	8,000-16,000
5	Very Hard Rock	Specimen requires many blows of hammer end of geological pick to fracture it.	1120-2240	16,000-32,000
6	Extremely Hard Rock	Specimen can only be chipped with point of geological hammer.	Over 2240	Over 32,000

s. Additional Description of Material: The material encountered in the boring shall have the following additionaldescriptions as is appropriate.

AASHTO Designation T-206 Standard Penetration for Granular (Sandy or Gravely) Soils		
Description	Abbreviation	Blow per Foot
Very Loose	VL	0 – 4
Loose	L	4 – 10
Medium Dense	MD	10 – 30
Dense	D	30 – 50
Very Dense	VD	> 50

AASHTO Designation T-206 Standard Penetration for Cohesive (Clayey) Soils			
Description	Abbreviation	Blow per Foot	Hand Manipulation
Very Soft	VS	0 – 1	Easily penetrated by fist.
Soft	S	2 – 4	Easily penetrated by thumb.
Medium Stiff	MST	4 – 8	Penetrated by thumb with moderate effort.
Stiff	ST	8 – 15	Readily indented by thumb, but no penetration
Very Stiff	VST	15 – 30	Readily indented by thumb nail.
Hard	H	>30	Indented by thumb nail with difficulty.

t. Color: The color should be described as Brown (Br.), Gray (Gr.), Black (Bl.), etc. If a major color appears to be modified by a secondary color, the modified color shall precede the major color such as Gray Brown (Gr. Br.). Colors may be either light (lt) or dark (dk).

u. Type Of Material:

Primary Description

i. Rock: Siltstone, shale, sandstone, limestone, claystone, coal, and conglomerate.

ii. Soil: Gravel, sandy gravel, gravelly sand, sand, silty sand, clayey sand, sandy silt, clayey silt, silty clay, sandy clay, and clay.

Secondary Description

List other material such as sand, gravel, boulder, and organic materialas follows:

Trace - 0 - 10%
Little - 11 - 20%
Some - 21 - 35%
and - 36 - 50%

The following soil components and sizes shall be used to in descriptions:

Soil Components and Sizes			
Component	**Size**		
	Mm	**in**	**US Standard Sieve No.**
Boulders	> 305	> 12	
Cobbles	76 - 305	3 – 12	
Coarse Gravel	19 - 76	¾ – 3	
Fine Gravel	4.75 - 19	$^3/_{16}$ – ¾	
Coarse Sand	2 - 4.75	$^3/_{32}$ – $^3/_{16}$	10 – 4
Medium Sand	0.425 - 2		40 – 10
Fine Sand	0.0745 - 0.425		200 – 40
Silt	0.002 - 0.074		
Clay	< 0.002		

Visual differentiation between silts and clays shall be made by manipulation as follows:

a. Silt: When subjected to shaking in the palm of the hand, a part of saturated inorganic silt expels enough water to give a glossy appearance to the surface and when then bent or slightly squeezed between the fingers, the surface of the part will become dull. The part upon working in the hand loses moisture, becomes brittle, breaks easily, and tends to dust.
b. Clay: Clay, at high water content, is sticky, is plastic over a wide range of water content, and can be rolled into a fine thread without breaking, and upon drying becomes hard and will not dust off.

Rock shall be described in accordance with the following:

a. In the examination and description of rock, the following terminology and factors shall be considered and employed:
    1. color,
    2. rock type,
    3. grain size,
    4. structure,
    5. bedding,
    6. weathering,
    7. type and number of fractures,
    8. moisture,
    9. hardness,
    10. RQD,
    11. HCSI, and
    12. note other qualifying factors.
b. Shale shall be further distinguished as clayey shale, limey shale, carbonaceous shale, or sandy shale. The term limey shall be used if the rock is calcareous or contains calcium carbonate. If silica is present, the term sandy shall be used.
c. The term carbonaceous shall apply to shale containing material of organic

origin. The term clay shale shall be used where the shale is argillaceous.

d. Rocks comprised of various degrees or organic content shall be classified as carbonaceous shale, coaly shale, or coal.
e. The relative hardness of the rock shall be defined as:
   extremely soft - 0;
   very soft - 1;
   soft - 2;
   medium hard- 3;
   hard - 4;
   very hard - 5; or extremely hard -6.
f. The condition of the rock shall be further defined as: weathered, broken, shattered, jointed, cavernous, or as containing slickensides.
g. In describing sandstone, the size of the sand grains shall be described as very fine, fine, medium, or coarse. Information concerning type cementation shall be given. Cross bedding shall be noted when occurring.
h. In describing a conglomerate, information shall be included concerning the kind and size of pebbles, cobbles, or boulders contained and the type and firmness of cementation.
i. Condition:
   Rock: Weathered, broken, jointed, shattered, cavernous, slickensides,etc.
j. Moisture:
   Dry – no surface moisture
   Moist – damp to the touch
   Wet – visible surface moisture

628.4-METHOD OF MEASUREMENT:

The quantity of drilling work done will be based upon the length of borings taken below the ground surface, without regard for the type of material encountered in the boring, as indicated by the below ground drill rod lengths, and as determined by the Engineer. All sampling and reporting shall be incidental to and included in the unit bid price of Exploratory Drilling and Sampling.

628.5-BASIS OF PAYMENT:

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

628.6-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
628004-001	“Exploratory Drilling and Sampling”	Lineal Foot

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 642
TEMPORARY POLLUTION CONTROL

642.1-DESCRIPTION:

DELETE THE FIRST PARAGRAPH AND REPLACE THE FOLLOWING.

This work shall consist of temporary control measures performed during the life of the Contract to control water pollution through use of berms, rock check dam, sediment structures (traps~~, ponds,~~ or ~~dams~~ basins), mulches, fiber mats, seeding slope drains, and other erosion control devices or construction methods, in accordance with these Specifications and in reasonably close conformity with the lines, grades, thickness and typical cross sections shown on the Plans or established by the Engineer.

642.5-SEEDING AND MULCHING:

642.5.1-General:

DELETE THE SECOND PARAGRAPH AND REPLACE THE FOLLOWING.

Seeding or mulching, or both, shall be performed on all cut and fill slopes, including waste sites and borrow pits, during the construction process. All disturbed areas such as diversion ditches, sediment ~~dams~~ basins, areas around sediment structures, haul road slopes, cleared and grubbed areas to remain exposed during a period of critical erosion, storage areas, location of batch plants, etc. shall be seeded when and where necessary to eliminate erosion.

642.7-METHOD OF MEASUREMENT:

DELETE THE SECOND AND THIRD PARAGRAPH AND REPLACE THE FOLLOWING.

Berms constructed prior to suspension of construction operations and slope drains will be measured in linear feet; sediment traps, ~~ponds, or dams~~ sediment basins, and sediment removal will be measured by the cubic yard; for sediment ~~dams~~ basins, risers will be measured by the unit and conduit for principal spillway under the dam will be measured in linear feet and included under Item 642008-*; seed will be measured by the pound; straw, hay and wood cellulose fiber mulch

will be measured by the ton; ~~wood chips or bark mulch will be measured by the cubic yard;~~ fertilizer and agricultural limestone will be measured by the ton; matting will be measured by the square yard; contour ditching will be measured by the linear foot. Measurements will be made on the surface of the work done when applicable. Anchoring for mulch or other chemical binders will not be measured separately, but their cost shall be included in the unit price bid for mulch. ~~Cereal rye or cereal wheat added to Type D mixture in fall seeding will not be included for payment but its cost shall be included in the unit prices in 642.9.~~

Temporary pipe will be measured by the linear foot complete and in place. If the Contractor elects to utilize a series of small pipes in lieu of one large pipe, measurement for payment will be made only for a length necessary to extend one conduit under the haul road or sediment ~~dam~~ basin.

642.9-PAY ITEMS:

DELETE ITEM 642034 "SEDIMENT DAM" AND REPLACE WITH THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
642034-*	Sediment ~~Dam~~ Basin	Cubic Yard

DELETE ITEM 642037 "SEDIMENT POND" FROM THE TABLE:

ITEM	DESCRIPTION	UNIT
~~642037-*~~	~~Sediment Pond~~	~~Cubic Yard~~

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 642
TEMPORARY POLLUTION CONTROL

642.7-METHOD OF MEASUREMENT:

ADD THE FOLLOWING:

642.7.1-Temporary Pollution Control, Unit's Value Method: For "Temporary Pollution Control" for which a number of units are established in the contract, will be measured by each temporary pollution control device used and accepted. The relative value of each temporary pollution control device shall be as shown in Table 642.7.1.

The total units of temporary pollution control shown in the Contract is an estimated amount only and may be adjusted up or down by the Engineer in accordance with the project needs.

TABLE 642.7.1

Description	(Item)	Unit	Value per Unit
Temporary Berm	(642001-001)	LF	2
Slope Drain	(642002-001)	LF	21
Seed Mixture, Temporary	(642004-001)	LB	2
Seed Mixture, B	(642004-002)	LB	5
Seed Mixture, D	(642004-003)	LB	12
Seed Mixture, L	(642004-004)	LB	18
Mulch, Straw or Hay	(642005-001)	TN	450
Mulch, Wood Cellulose Fiber	(642005-002)	TN	810
Mulch	(642005-003)	TN	2,500
Fertilizer	(642006-001)	TN	850
Fiber Matting	(642007-001)	SY	2
Temporary Pipe	(642008-001)	LF	73
Contour Ditch	(642009-001)	LF	2
Agricultural Limestone	(642010-001)	TN	68
Silt Fence	(642012-001)	LF	3
Super Silt Fence	(642015-001)	LF	10
Compost Filter Sock, 8 IN	(642016-001)	LF	10
Compost Filter Sock, 12 IN	(642016-002)	LF	5

TABLE 642.7.1

Description	(Item)	Unit	Value per Unit
Compost Filter Sock, 18 IN	(642016-003)	LF	8
Compost Filter Sock, 24 IN	(642016-004)	LF	10
Compost Filter Sock, 32 IN	(642016-005)	LF	11
Rock Check Dam	(642031-001)	EA	93
Sediment Trap	(642033-001)	CY	17
Sediment Dam	(642034-001)	CY	17
Riser	(642035-001)	EA	7,050
Skimmer	(642035-002)	EA	1,625
Sediment Removal	(642036-001)	CY	7
Sediment Pond	(642037-001)	CY	6
Inlet Protection	(642040-001)	EA	270
Flocculant Block	(642042-001)	EA	180
Premanufactured Ditch Check	(642043-001)	EA	67
Turbidity Curtain	(642045-002)	FT	100
Dewatering Device	(642050-001)	EA	720
Erosion Control Matting	(642055-001)	SY	2

Note 1: Units are calculated by multiplying the quantity of temporary pollution control devices installed on project by the rate value.

Example: 175 lbs of "Seed Mixture, Temporary" X 2 = 350 Units

Note 2: Unless posted elsewhere in the Contract, revisions to Table 642.7 will be calculated from the table posted at: http://www.transportation.wv.gov/ (this link will be revised prior to publication of 2023 standard)

642.9-PAY ITEMS:

ADD THE FOLLOWING ITEM TO THE TABLE:

ITEM	DESCRIPTION	UNIT
642000-001	Temporary Pollution Control	Unit

May 18, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 663
PAVEMENT MARKINGS

663.8-PAY ITEMS:

DELETE ITEM 663010* AND REPLACE THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
663010-*	Lane ~~Drop~~ Reduction Arrow, Type V	Each

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 708
JOINT MATERIALS

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

DELETE THE HEADING AND REPLACE WITH THE FOLLOWING:

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

May 16, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 711
PAINTS, COATING, OILS, AND INKS

711.5-CONCRETE PROTECTIVE COATINGS AND STAIN:

711.5.2-Physical Requirements:

DELETE BULLET NUMBER iv. IN SUBSECTION 711.5.2 AND REPLACE WITH THE FOLLOWING:

iv. **Color**–The color choice~~s permissible~~ shall conform to SAE International AMS-STD-595 A, Federal Standard Colors. The color difference, ΔE, of the acceptance samples shall not be more than five units from the chosen Federal Standard Number~~s 37925, 36650, 37925, 36622~~.

711.5.3-Approval:

DELETE THE CONTENTS OF SUBSECTION 711.5.3 AND REPLACE WITH THE FOLLOWING:

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

711.12-EPOXY COATINGS:

711.12.2-Composition:

DELETE BULLET NUMBER i. IN SUBSECTION 711.12.2 AND REPLACE WITH THE FOLLOWING:

i. Color–The color ~~permissible~~ choice shall conform to SAE International AMS-STD-595 A, Federal Standard Colors. The color difference, ΔE, of the acceptance samples shall not be more than five units from the chosen Federal Standard Number~~s 20062, 26373~~.

711.22-ZINC RICH LOW VOC SYSTEM:

711.22.1-General:

DELETE THE CONTENTS OF SUBSECTION 711.22.1 AND REPLACE WITH THE FOLLOWING:

~~Initial approval of the system will be based on testing of the complete system for specification compliance.~~ Each product in the system shall be from the same paint manufacturer. Each coat shall be a contrasting color to the one previously applied. The use of the intermediate coat meeting 711.22.3, shall be at the option of the paint manufacturer. In either case, the adhesion of the system shall be a minimum of 4A when tested in accordance with ASTM D3359, Method A. The adhesion test shall be conducted approximately 14 days after application of the top coat. All products shall have a maximum VOC of 2.8 lbs / gallon ~~(336 g/l)~~ with exception of the primer, which shall have a maximum VOC of 3.5 lbs / gallon ~~(420 g/l)~~. The paint storage life will be based on manufacturer recommendations. The prime fabricator is responsible for choosing the paint system when shop applied.

711.22.4-Top Coat:

711.22.4.1-Physical Requirements:

DELETE BULLET NUMBER ii. IN SUBSECTION 711.22.4.1 AND REPLACE WITH THE FOLLOWING:

ii. **Color**–The color choices ~~permissible~~ shall conform to SAE International AMS-STD-595 A, Federal Standard Colors. The color difference, ΔE, of the acceptance samples shall not be more than five units from the chosen Federal Standard Number ~~20062, 26373~~.

ADD THE FOLLOWING:

711.23-MATERIAL/SYSTEM APPROVAL:

711.23.1-The Division will develop an approved list of products meeting this specification. This list will be placed on the Division's website. The list may be based upon testing performed by the Division, or the Division may choose materials from the National Transportation Product Evaluation Program (NTPEP) and/or the North East Protective Coating Committee (NEPCOAT) tested materials. Upon approval by the Division, further testing will not be required unless random samples tested by the Division show non-compliance with any of the specification requirements. The manufacturer shall supply the MCS&T Division with the following for each product upon request:

i. One, one-gallon kit of the product
ii. One gallon thinner
iii. Instructions for mixing, thinning and application
iv. Materials Safety Data Sheet for both the paint and thinner
v. Product data sheet

711.24-SAMPLE SUBMISSION:

711.24.1-All samples for approval testing and all supporting documentation shall be shipped to the address provided below:

West Virginia Division of Highways
Materials Control, Soils and Testing
Paint Laboratory
190 Dry Branch Drive
Charleston, West Virginia, 25306

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

i. Name and address of Manufacturer
ii. Trade Name or Trade Mark
iii. Type of Paint
iv. Lot or Batch number
v. Date of manufacturing
vi. All SDS/PDS information pertaining to the material
vii. Reference to the Division's Standard Specifications

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SPECIAL PROVISION

FOR

DISADVANTAGED BUSINESS ENTERPRISE UTILIZATION

I. GENERAL:

The West Virginia Division of Highways (Division) is committed to assuring the participation of Disadvantaged Business Enterprises (DBEs) in our highway construction program managed by the Civil Rights Compliance (CRC) Division. In support of this commitment and in compliance with the requirements for contracts funded, in whole or part, with assistance from the United States Department of Transportation (USDOT), the Division requires that any contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of USDOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Division deems appropriate.

The contractor shall designate and make known to the Division a liaison officer who is assigned the responsibility of effectively administering and promoting an active program for utilization of Disadvantaged Business Enterprises (DBEs).

If a formal goal has not been designated for this contract, all contractors are encouraged to consider DBEs for subcontract work as well as for the supply of materials and services needed for the performance of this work.

The contractor is encouraged to use the services of banks owned and controlled by minorities or women. Agreements between a bidder/proposer and the DBE in which the DBE promises not to provide subcontracting quotations to other bidders/proposers are prohibited.

II. DEFINITIONS:

A. "Disadvantaged Business Enterprise" means a firm that is certified as a DBE, in accordance with the provisions of 49 CFR §26, by the West Virginia Department of Transportation's DBE Unified Certification Program.

B. "USDOT-assisted contract" means any contract between the Division and a contractor (at any tier) funded in whole or part with USDOT financial assistance, including letters of credit or loan guarantees, except a contract solely for the purchase of land.

C. "Good faith efforts" means efforts to achieve a DBE goal or other requirement of this part which, by their scope, intensity, and appropriateness to the objective, can reasonably be expected to fulfill the program requirement.

D. "Joint venture" means an association of a DBE firm and one or more other firms to carry out a single, for-profit business enterprise, for which the parties combine their

property, capital, efforts, skills and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the contract and whose share in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

E. **"Primary industry classification"** means the North American Industrial Classification System (NAICS) designation which best describes the primary business of a firm. The NAICS is described in the *North American Industry Classification Manual—United States*, which is available via the internet at the U.S. Census Bureau Web site: http://www.census.gov/eos/www/naics/.

III. DBE CERTIFICATION REQUIREMENTS:

A. In order to be classified as a DBE under this specification, a firm must be approved by the DBE Unified Certification Program prior to the letting date of any project in which a firm wants to participate as DBE.

B. Under 49 CFR Part 26.71(n), DBE firms are not certified in general terms, in a way that makes every type of work performed eligible for DBE credit. Rather, the WVDOT, through its Unified Certification Program, will grant certification to a firm only for specific types of work which the socially and economically disadvantaged owners have the ability to control.

C. The DBE rule requires all certification actions, including those expanding the types of work a firm is authorized to perform for DBE credit, to be made final before the date on which bidders on a prime contract must respond to a solicitation [49 CFR 26.81(c)].

D. The DBE Uniform Certification Application and related documents, as well as the directories of certified DBE consulting and contracting firms, may also be obtained from the Division online at: http://www.transportation.wv.gov/eeo/DBE/Pages/default.aspx

IV. DBE GOAL:

A. The DBE goal determined by the West Virginia Division of Highways for this contract is_____% of the contract bid amount.

B. The contractor shall indicate its goal in the appropriate space in Section C, Item 3 – Contractor's Goal for DBE Participation, of the Notice contained in the project proposal. The goal so indicated will be used in determining the award of the contract in accordance with this Special Provision and Section 103 of the Standard Specifications.

V. CONTRACTOR'S DBE PLAN:

A. **Plan requirements.** All bidders ~~are encouraged to~~ shall submit their DBE Participation Plan (Section C – Contractor's Plan for DBE Participation) ~~with their bid; or no later than 5 calendar days after bid opening~~ when submitting his/her bid on www.Bidx.com, as described in the Notice contained in the project proposal. ~~A Participation Plan form is attached to this provision.~~ The Plan shall include the following:

1. Name of DBE Subcontractor(s) or Suppliers(s).
2. Description of work each is to perform, to include: Line Number, Item Number, Description, ~~Type of Work,~~ Quantity, Unit, Unit Cost and Total Cost.
3. The dollar value of each proposed DBE subcontract and the percentage of the total contract value represented by combined DBE participation; the extent to which

payments to DBEs may be counted as DBE participation is set forth in Section VIII., DBE Participation Requirements, below.

4. ~~Written and signed documentation~~ Submitting the Plan to the Division on www.Bidx.com, as described in Section C of the proposal document shall be considered assurance of the bidder's commitment to use a DBE subcontractor whose participation is being utilized to meet the DBE contract goal.
5. Written and signed confirmation from the DBE that it is participating in the contract as provided in the prime contractor's commitment, and any other documentation deemed necessary by the Civil Rights Compliance (CRC) Division, must be submitted to the CRC Division before a contractor's DBE Plan will be approved.
6. Plans ~~may~~ shall be submitted ~~by e-mail to~~ **Error! Hyperlink reference not valid.**~~, fax 304-558-4236, or personal delivery and must be received by the WVDOT CRC Division no later than 4:00 p.m. eastern time on the submission due date~~ with the bid in www.Bidx.com.

B. Effect of Failure to Submit a Plan. ~~The bidder who does not submit a DBE Participation plan with the bid shall submit it no later than 5 calendar days after the bid opening as a matter of responsibility.~~ Failure to submit ~~all required information within the required time frame shall be just cause for the annulment of award; and the amount of the guaranty deposited with the Proposal may be retained by the Division and deposited in the Division of Highways Fund, not as a penalty, but as liquidated damages.~~ a DBE Plan with the bid, or failure to provide the Division any requested documentation within five (5) calendar days of the request, is cause to deem the bidder irresponsible. An irresponsible bidder forfeits its guaranty bond, and the bond will be deposited to the Division of Highways fund. The award may then be made to the next lowest responsible bidder, or the work may be readvertised or otherwise, as decided by the Division ~~may decide~~.

C. Qualification of DBEs in Plan. In order to be accepted under this program all DBE subcontractors and suppliers of materials or services must be certified for the applicable Type of Work and NAICS code, in accordance with Section III of this provision, at the time of the letting.

If a DBE firm has not been certified for the type of work it is intending to perform on a given contract, then the Division of Highways cannot count the firm's participation on that contract toward meeting DBE contract goals or the agency's overall DBE goal. If a bidder has submitted a bid with DBE participation in response to the DBE goal, and the DBE firm named in the bid documents has not been certified in the type of work that the DBE firm would perform on the contract, then the bid shall not be considered because it does not qualify as a responsible bid.

D. Changes to DBE Participation Plan. The contractor shall utilize the specific DBEs listed on the DBE Participation Plan to perform the work and supply the materials for which each is listed unless the contractor obtains written consent by the CRC Division. Unless written consent is provided, the contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE.

E. Termination of a DBE from DBE Participation Plan. A prime contractor cannot terminate a DBE subcontractor listed on an approved DBE Participation Plan without good cause, documented by the prior written consent of the Division. For the purposes of this paragraph, good cause includes, but is not limited to, the following circumstances:

1. The listed DBE subcontractor fails or refuses to execute a written contract;
2. The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
3. The listed DBE subcontractor fails or refuses to meet the prime contractor's after-bid-award reasonable, non-discriminatory bond requirements;
4. The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
5. The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215, and 1200 or applicable State law;
6. The WV Department of Transportation has determined that the listed DBE subcontractor is not a responsible contractor;
7. The listed DBE subcontractor voluntarily withdraws from the project and provides written notice to the Division of its withdrawal;
8. The listed DBE is ineligible to receive DBE credit for the type of work required;
9. A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract;
10. Other documented good cause as determined by the Division.

F. Termination without Good Cause. Good cause does not exist if the prime contractor seeks to terminate a DBE upon which it relied to obtain the contract if the reason for the proposed termination is so that the prime contractor can self-perform the work for which the DBE contractor was engaged or so that the prime contractor can substitute another DBE or non-DBE contractor after contract award.

G. Procedure for Terminating DBE from DBE Participation Plan. In order to obtain Division approval to terminate and/or substitute a DBE subcontractor, the following steps are required:

1. The prime contractor must give notice in writing to the DBE subcontractor, with a copy to the Division, of its intent to request to terminate and/or substitute; the notice must state the reason for the termination and/or substitution and must give the DBE subcontractor five (5) calendar days to respond to the notice.
2. The DBE subcontractor must respond to the notice within the five calendar day period and advise the Division and the prime contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Division should not approve the prime contractor's action; if required in a particular case as a matter of public necessity (*e.g.* safety), the Division may provide a response period shorter than five days.
3. In addition to post-award terminations, the provisions of this bullet (G) *Procedure for Terminating DBE from DBE Participation Plan* apply to pre-award deletions of, or substitutions for, DBE firms put forward by offerors in negotiated procurements.

VI. CONTRACT AWARD REQUIREMENTS:

A. Good Faith Efforts Required. In order to be deemed responsible and be awarded this contract, a bidder must demonstrate good faith efforts to meet the DBE goal established by the Division. The bidder can meet this good faith requirement in either of two ways:

1. The bidder can meet the goal, documenting commitments for participation by DBE firms sufficient for this purpose on a Contractor's Plan for DBE Participation (a sample is attached to this Special Provision), or
2. The bidder can document adequate good faith efforts showing that the bidder took all necessary and reasonable steps to achieve a DBE goal which, by their scope, intensity, and appropriateness to the objective, would be reasonably expected to obtain sufficient DBE participation, even if they were not fully successful.

   The following is a list of types of actions that will be considered as part of the bidder's good faith efforts to obtain DBE participation. It is not intended to be a mandatory checklist, nor is it intended to be exclusive or exhaustive. Other factors or types of efforts may be relevant in appropriate cases.

   a. Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBEs to respond to the solicitation. The bidder must determine with certainty if the DBEs are interested by taking appropriate steps to follow up initial solicitations.
   b. Selecting portions of the work to be performed by DBEs in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.
   c. Providing interested DBEs with adequate information about the plans, specifications and requirements of the contract in a timely manner to assist them in responding to a solicitation.
   d. Negotiating in good faith with interested DBEs.
      i. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBEs to perform the work.
      ii. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBEs is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of

the responsibility to make good faith efforts. Prime contractors are not, however, required to accept higher quotes from DBEs if the price difference is excessive or unreasonable.

e. Not rejecting DBEs as unqualified without sound reasons based on a thorough investigation of their capabilities. The contractor's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the contractor's efforts to meet the project goal.

f. Making efforts to assist interested DBEs in obtaining bonding, lines of credit, or insurance required by the Division or contractor.

g. Making efforts to assist interested DBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

h. Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state and Federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBEs.

B. Determining Good Faith Efforts. In determining whether a bidder has made good faith efforts, the Division may take into account the performance of other bidders in meeting the contract. For example, when the apparent successful bidder fails to meet the contract goal, but others meet it, the Division may reasonably raise the question of whether, with additional reasonable efforts, the apparent successful bidder could have met the goal. If the apparent successful bidder fails to meet the goal, but meets or exceeds the average DBE participation obtained by other bidders, the Division may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made good faith efforts.

C. Documentation of Good Faith Effort. When the established contract goal is not being met, all documentation of good faith effort must be submitted to the CRC Division, and must be received no later than five (5) calendar days after bid opening as a matter of responsibility. Contractors who fail to demonstrate that good faith efforts were made prior to the bid shall not be eligible to be awarded the contract. The Division may take any efforts it deems appropriate to assure the completeness and accuracy of documentation submitted to demonstrate good faith efforts.

D. Bidder's Assurance. ~~The bidder's signature in Section J of the Notice contained in this proposal~~ Submitting the bid to the Division on www.Bidx.com shall be ~~written~~ considered assurance he/she will comply with this special provision. The Contractor's proposed DBE goal percent (Section C ~~Item 3~~) must be completed or the bid will be deemed irregular.

E. Failure to Demonstrate Good Faith Effort. A bid that fails to demonstrate good faith effort MUST be excluded from consideration as non-responsible. Under 49 CFR 26.53(a), when there is a contract goal the Division "must award the contract only to a bidder who makes a good faith effort to meet it." Federal funds cannot be used to fund contract activities that are not in compliance with 49 CFR Part 26. If the Division determines that the apparent successful bidder has failed to meet the requirements to demonstrate good faith effort, the Division will, before taking any further action, provide

the bidder an opportunity for administrative reconsideration of the Division's determination.

1. As part of this reconsideration, the bidder will have the opportunity to provide written documentation or argument concerning the issue of whether it made adequate good faith effort, by either meeting the contract goal or by documenting its actions to do so.
2. The Division's decision on reconsideration will be made by an official who did not take part in the original determination that the bidder failed to make adequate good faith effort.
3. The bidder will have the opportunity to meet in person with the reconsideration official to discuss the issue of whether it made adequate good faith effort.
4. The Division will send the bidder a written decision on reconsideration, explaining the basis for finding that the bidder did or did not make good faith effort.
5. The result of the reconsideration process is not appealable to the U.S. Department of Transportation.

VII. CONTRACT COMPLIANCE REQUIREMENTS:

Each contractor or subcontractor that fails to carry out the requirements set forth below will be subject to a breach of contract and, after notification to the Federal Highway Administration, the West Virginia Division of Highways may terminate the contract or subcontract or initiate other such remedy as deemed appropriate.

A. Policy. It is the policy of the West Virginia Division of Highways to ensure non-discrimination in the award and administration of USDOT-assisted contracts, to create a level playing field on which DBEs can compete fairly for USDOT-assisted contracts, to ensure that the DBE program is narrowly tailored in accordance with applicable law, to ensure that only firms that fully meet eligibility standards are permitted to participate as DBEs, to help remove barriers to the participation of DBEs in USDOT-assisted contracts, and to assist in the development of firms that can compete successfully in the marketplace outside the DBE program. Consequently, the DBE requirements of 49 CFR Part 26 apply to this contract.

B. DBE Obligation. By execution of the contract, the contractor expressly accepts and agrees to the following assurance, and further agrees to include this assurance in each and every subcontract executed between the prime contractor and a subcontractor: The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of USDOT-assisted contracts.

C. Sanctions. Failure by the prime contractor to fulfill the DBE requirements and to demonstrate good faith efforts constitutes a breach of contract. In the event of a breach of contract, the Division may take the following actions:

1. Withholding of progress payments.
2. Withholding payment to the prime contractor in an amount equal to the unmet portion of the contract goal.
3. Termination of the contract.
4. Such other remedy as the Division deems appropriate.

D. Records and Reports. All contractors must keep detailed records and provide regular reports to the Division on a quarterly basis, or as requested, on their progress in meeting contractual DBE obligations. These records may include, but are not be limited to, payroll, lease agreements, cancelled payroll checks, cancelled supply and material checks, and executed subcontracting agreements. At the end of each quarter, prime contractors will be requested to submit certified reports on monies paid to each DBE subcontractor/supplier on all active USDOT-assisted contracts.

VIII. COUNTING DBE PARTICIPATION TOWARD GOAL REQUIREMENTS:

The Division will only count expenditures to a DBE contractor toward DBE goals if the DBE is performing a commercially useful function on the contract. A commercially useful function is generally being performed when a DBE is responsible for the execution of a distinct element of the work and is carrying out its responsibilities by actually performing, managing and supervising the work involved in accordance with normal industry practice (except where such practices are inconsistent with the DBE regulations and these guidelines) and when the DBE firm receives due compensation as agreed upon for the work performed. Regardless of whether an arrangement between the contractor and the DBE represent standard industry practice, if the arrangement erodes the ownership, control or independence of the DBE or does not meet the commercially useful function requirement, sanctions against the DBE firm and the prime contractor may be pursued.

A. DBE Management: The DBE must be responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The DBE must also be responsible, with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering materials, and installing (where applicable) and paying for the material itself. The DBE must perform the work of the contract with its own work force.

If a DBE does not perform or exercise responsibility for at least 30 percent of the total cost of its contract with its own work force, or the DBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involved, the Division will presume that the DBE is not performing a commercially useful function; the DBE may present evidence to rebut this presumption.

When a DBE subcontracts part of the work of its contract to another firm, the value of the subcontracted work may be counted toward DBE goals only if the DBE's subcontractor is itself a DBE. Work that a DBE subcontracts to a non-DBE firm does not count toward DBE goals.

The Division's decisions on commercially useful function are reviewable by the Federal Highway Administration, but are not appealable to the USDOT.

B. Equipment: In order to perform a commercially useful function the DBE subcontractor shall be responsible for any equipment necessary to complete the work within the approved Participation Plan.

1. The DBE may lease equipment consistent with standard industry practices.
    a. The DBE shall be responsible for negotiating the cost, arranging for the delivery of, and paying for leased equipment.
    b. Copies of the lease agreements shall be submitted for approval by the Division prior to the work being performed.

c. The DBE subcontractor shall provide paid invoices to the Division for all leased equipment.

2. The cost of equipment leased from the prime contractor or its affiliates will not be counted towards the goal. The Division does not consider a DBE subcontractor as performing a commercially useful function when it leases equipment from a prime contractor and the equipment is a critical element of the DBE's ability to perform its contract. All leasing agreements, including incidental equipment leasing agreements between the prime contractor and the DBE subcontractor must be submitted to and approved by the WVDOT EEO Division prior to performance of the work.

C. Materials: The DBE shall negotiate the cost, determine quality and quantity, arrange delivery of, install (where applicable) and pay for the materials and supplies required for the work of the contract. Invoices for materials should be in the name of the DBE firm not the prime contractor. The Division will count expenditures by DBEs for materials or supplies toward DBE goals as provided in the following;

1. If the materials or supplies are obtained from a DBE manufacturer, count 100 percent of the cost of the materials or supplies toward DBE goals. For the purposes of this paragraph, a manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described by the specifications.
2. If the materials or supplies are purchased from a DBE regular dealer, count 60 percent of the cost of the materials or supplies toward DBE goals. A regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

   Packagers, brokers, manufacturers' representatives, or other persons who arrange or expedite transactions are not regular dealers.
3. With respect to materials or supplies purchased from a DBE which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of materials or supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site, toward DBE goals, provided the fees are reasonable and not excessive as compared with fees customarily allowed for similar services. The Division will not count any portion of the cost of the materials and supplies themselves toward DBE goals, however.

   The WVDOH may allow the use of joint checks to purchase material/supplies used by the DBE when the following conditions are met: (1) the prime contractor acts solely as a guarantor, (2) the DBE must release the check to the supplier, (3) such payment arrangements are available to all subcontractors and not restricted to DBE's, (4) advance approval is obtained by WVDOH EEO Division.
4. If the materials or supplies are obtained from the prime contractor or an affiliate of the prime contractor, the cost of the materials or supplies will not be counted toward the goal.

D. DBE Trucking Firms: To be certified as a DBE trucking firm, the firm must own at least one fully operational truck that is fully licensed and insured and that is used on a day to day basis. DBE trucking firms must be covered by a subcontract or a written agreement approved by the DOT EEO office prior to performing their portion of the work. In order to perform a commercially useful function, the DBE trucking firm is restricted to the same subcontracting limitation in effect for other contractors. The DBE trucking firm must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a this contract, and there cannot be a contrived arrangement for the purpose of meeting DBE goals.

1. The DBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.
2. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
3. The DBE may also lease trucks from a non-DBE firm, including an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit for the total value of transportation services provided by DBE-owned trucks on the contract. The DBE is entitled to credit for the total value of transportation services provided by non-DBE lessees not to exceed the value of transportation services provided by DBE-owned trucks on the contract.

   Example – DBE Firm X uses two of its own trucks on a contract. It leases two trucks from DBE Firm Y and six trucks from non-DBE Firm Z. DBE credit would be awarded for the total value of transportation services provided by Firm X and Firm Y, and may also be awarded the total value of transportation services provided by four of the six trucks provided by Firm Z. In all, full credit would be allowed for the participation of eight trucks. With respect to the other two trucks provided by Firm Z, DBE credit could be awarded only for the fees or commissions pertaining to those trucks Firm X receives as a result of the lease with firm Z.
4. A lease must indicate that the DBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the DBE, so long as the lease gives the DBE absolute priority for use of the leased truck. Leased trucks must display the name and identification number of the DBE.

G. Suspensions and Decertification's: If any DBE listed on the *Contractor's DBE Plan* has been suspended or decertified as a DBE **before** the execution of a subcontract agreement between the Prime and the DBE, the DBE's proposed work cannot be counted toward the project's DBE goal. Conversely, if a DBE has been suspended or decertified **after** the Prime and the DBE have executed a subcontract agreement, the contractor may continue to use the DBE and will continue to receive credit toward the project's DBE goal.

H. North American Industrial Classification (NAIC):

DBE work can only be counted toward meeting the contract DBE goal if the work to be performed by the DBE is:

1. Within the Type of Work for which the DBE is certified AND

2. Within the classification of the North American Industry Classification System (6 digit NAIC codes) approved for the DBE.

PARTICIPATION OF A DBE SUBCONTRACTOR WILL NOT BE COUNTED TOWARD A CONTRACTOR'S FINAL COMPLIANCE WITH ITS DBE OBLIGATIONS ON A CONTRACT UNTIL THE AMOUNT BEING COUNTED HAS ACTUALLY BEEN PAID TO THE DBE.

~~July 23, 2020~~ July 13, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
DISADVANTAGED BUSINESS ENTERPRISE UTILIZATION

CONTRACTOR'S PLAN FOR DBE PARTICIPATION

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
DBE Sub-Contractor or Supplier	**Line Number**	**Item Number**	**Description**	**Type of Work (from DBE Directory)**	**Quantity**	**Unit**	**Unit Cost**	**Total Cost**

[10] CONTRACTOR'S DBE GOAL: TOTAL COST OF ALL DBE PARTICIPATION $_____. PERCENT OF TOTAL BID AMOUNT: _____

EXPLANATORY NOTES:

- "DBE Sub-Contractor" (column [1]), for the purpose of this certificate, means a disadvantaged business as defined by Special Provisions in this Proposal.
- If material is to be supplied, the figure in column [9] shall not exceed 60% of the actual cost unless the material is manufactured by a DBE; if material IS manufactured by a DBE, 100% of the cost may be recorded.
- If material is not supplied by a regular dealer as defined in 49 C.F.R. 26.55€(2)(ii), the figure in column [9] shall only include a reasonable and customary fee or commission for providing a bona fide service.
- For line [10], enter the total cost of DBE participation and the percentage of the total contract bid amount that this total DBE cost represents.
- The Contractor's authorized signature on this plan shall serve as documentation of commitment to use the DBE subcontractor(s) listed above by the contractor to meet the contract goal.
- The Contractor shall submit written and signed confirmation from the DBE that it is participating in the contract **as provided in the prime contractor's commitment**.

Authorized Signature _____ **Title** _____.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 106
CONTROL OF MATERIALS

106.1-SOURCE OF SUPPLY AND QUALITY REQUIREMENTS:

106.1.1-State Requirements Governing Domestic Aluminum, Glass, and Steel:

106.1.1.1-Definitions: Unless the context in which used clearly requires a different meaning, as used in this section:

"Public Works" includes roads, highways, streets, bridges, sidewalks, sewage systems, buildings, engineering and architectural works, and any other structure, facility or improvement constructed or undertaken by the Division.

"Aluminum and glass products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly processed from aluminum and glass.

"Domestic aluminum and glass products" means aluminum and glass products for which all manufacturing processes, including application of a coating, have occurred in the United States.

"Steel products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more of such operations, from steel made by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making process.

"Domestic steel products" means steel products for which all manufacturing processes, including application of a coating, have occurred in the United States.

"Coating" means all processes that protect or enhance the value of a material or product to which it is applied, such as, but not limited to, epoxy coatings, galvanizing, and painting.

"State contract project" means any erection or construction of, or any addition to, alteration of or other improvement to any building or structure, including, but not limited to, roads or highways, or the installation of any heating or cooling or ventilating plants or other equipment, or the supply of any materials for such projects, pursuant to a contract with the State of West Virginia for which bids were solicited.

"United States" means the United States of America and includes all territory, continental or insular, subject to the jurisdiction of the United States.

106.1.1.2-State Preference For Domestic Aluminum and Glass Products: Any aluminum or glass products to be supplied in the performance of any contract or subcontract for the construction, reconstruction, alteration, repair, improvement, or

maintenance of public works or for the purchase of any item of machinery or equipment to be used at the sites of public works shall be manufactured in the United States and compliant with Chapter 5, Article 19 of the West Virginia Code**.** This requirement applies to all federal and state public works contracts, including state purchase order contracts. This requirement does not apply to any contract awarded in an amount less than or equal to $50,000.

The Division shall not authorize or make any payments to a Contractor not fully compliant with this requirement. Prior to any payment, the Division shall require the Contractor to furnish a certificate of compliance which covers all materials and products involved, including those of any subcontractors and suppliers. Any payments made by the Division to any Contractor who did not fully comply with this requirement may be recovered by the Division.

106.1.1.3-State Preference For Domestic Steel Products: Any steel products used or supplied for a state contract project shall be manufactured, including the application of any coatings, in the United States and compliant with Chapter 5, Article 19 and Chapter 5A, Article 3, Section 56 of the West Virginia Code, entitled the "West Virginia American Steel Act of 2001." This requirement applies to all federal and state contracts, including state purchase order contracts.

The Division shall not authorize or make any payments to a Contractor not fully compliant with this requirement. Prior to any payment, the Division shall require the Contractor to furnish a certificate of compliance which covers all materials and products involved, including those of any subcontractors and suppliers. Any payment made to any Contractor who did not fully comply with this requirement may be recovered by the Division.

106.1.1.4-Exceptions: Any exceptions to state preference requirements for domestic aluminum, glass, and steel products will be in accordance with MP 106.XX.XX and shall be compliant with Chapter 5, Article 19 and Chapter 5A, Article 3, Section 56 of the West Virginia Code.

When foreign-made aluminum, glass, and steel products are used or supplied in compliance with an approved exception, the Contractor shall be responsible for providing procedures acceptable to the Division for determining that specification requirements are met, including all inspections at no additional cost to the Division. The use of foreign-made products will not be reason for grant an extension of contract time.

106.1.2-Federal Requirements Governing Domestic Steel, Iron, and Construction Materials:

106.1.2.1-Definitions: Unless the context in which used clearly requires a different meaning, as used in this section:

"Material" means any tangible substance incorporated into a Federal-aid highway project.

"Federal-aid highway project" means highway construction, maintenance, and utility projects funded in whole or in part with Federal-aid funds.

"Manufacturing process" means any process which modifies the chemical content, the physical size or shape, or the final finish of a material, including melting and mixing, rolling, extruding, machining, bending, grinding, drilling, and coating.

"Coating" means all processes which protect or enhance the value of the material to which the coating is applied.

"Construction material" means an article, material, or supply that is or consists primarily of non-ferrous metals, plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), glass (including optic glass), lumber, or drywall.

106.1.2.2-Federal Use of Domestic Steel and Iron: Any steel or iron materials used for a Federal-aid highway project shall be manufactured in the United States and compliant with 23 U.S.C. 313 and 23 CFR 635.410, entitled "Buy America Requirements." No steel or iron materials may be used for a Federal-aid highway project unless all manufacturing processes, including application of a coating, occur in the United States. Buy America also applies to all Federal-aid eligible projects within the scope of a finding, determination, or decision under the National Environmental Policy Act (NEPA), regardless of funding source, if at least one contract within the scope of the NEPA decision is funded with Federal funding provided under Title 23.

Buy America requirements do not apply to non-ferrous alloy materials used to make steel or any raw materials (iron ore and alloys), scrap, pig iron, or processed, pelletized, and reduced iron ore. Buy America requirements do not apply to temporary elements not permanently incorporated into a project, such as falsework, temporary sheet piling, detour bridges and the like; temporary elements left in place at the Contractor's convenience, unless the contract plans and specifications require steel or iron components (i.e. stay-in-place forms, ties for steel, sheet piling, etc.) or imply that the item be left in place; or items that are simply moved from one place to another within the same project.

When steel or iron materials are used, the Contractor shall supply adequate documentation certifying compliance with Buy America requirements prior to the permanent incorporation of the materials into the project. Any exception to Federal Buy America requirements for domestic steel and iron will be in accordance with MP 106.XX.XX and shall be compliant with 23 U.S.C. 313 and 23 CFR 635.410.

106.1.2.3-Federal Use of Domestic Construction Materials: Any construction materials, as defined in Section 106.1.2.1, used for a Federal-aid highway construction project shall be manufactured in the United States and compliant with the "Infrastructure Investment and Jobs Act," Section 70901-52, entitled the "Build America, Buy America Act." No construction material may be used for a Federal-aid highway project unless all manufacturing processes, including application of a coating, occur in the United States. Buy America also applies to all Federal-aid eligible projects within the scope of a finding, determination, or decision under the National Environmental Policy Act (NEPA), regardless of the funding source, if at least one contract within the scope of the NEPA decision is funded with Federal funding provided under Title 23.

Buy America only applies to construction materials that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment,

and supplies, such as temporary scaffolding, removed at or before completion of the project. Nor does Buy America apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished project, but are not an integral part of or permanently affixed to the structure.

When construction materials are used, the Contractor shall supply adequate documentation certifying compliance with Buy America requirements prior to the permanent incorporation of the materials into the project.

Any exceptions to Federal Buy America requirements for domestic construction materials will be in accordance with MP 106.XX.XX and shall be compliant with the Build America, Buy America Act.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 109
MEASUREMENT AND PAYMENT

109.20-LOAD LIMIT VIOLATIONS AND WEIGH TICKETS:

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

109.20-~~LOAD LIMIT VIOLATIONS AND~~ WEIGH TICKETS:

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

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

A weigh ticket shall be required with each load of material from a commercial source which would normally have truck scales. This includes, but is not limited to, all asphalt paving materials and all aggregates regardless of the contract pay unit. The weigh ticket shall include gross, tare, and net weights, time and date of loading, Item Number or Description of Materials, Contract Number or Project Number, number of axles on haul unit, license number of haul unit, and signature of the weigher certifying that all information on the ticket is correct. If the weigher's name is printed by the computer on the ticket, then it only needs to be initialed by the weigher.

~~The Department will accept electronic ticket delivery (e-ticket) as documentation on projects provided that the standard information currently provided on the paper ticket is included on the e-ticket. The e-ticketing system must provide WVDOH field personnel the ability to access tickets from a smartphone, tablet, or laptop and to make notes associated with each ticket if needed. The service must also provide a daily summary report. A digital signature of the weigh person on an e-ticket or daily summary report shall be considered the equivalent as a hand-signed/initialed, printed ticket.~~

For material from a commercial source or a batch plant, which would not normally have truck scales, a weigh ticket documenting the tare weight, number of axles on the haul unit, license number of haul unit, date weighed, location of scales, and signature of the weigher certifying that all information on the ticket is correct, may be supplied for each haul unit as an alternate to the ticket required in the previous paragraph. The tare weight ticket shall be supplied for each contract

on a yearly basis and when modifications are made to the vehicle or combination of vehicles. The weight of the material delivered shall be calculated and furnished by the vendor/supplier shipping the material to the project site or DOH facility. This includes, but is not limited to, concrete, structural steel, piling, reinforcing steel and all prepackaged material of known weight, such as cement, grout, fertilizer, lime, abrasives, etc.

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

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

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

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

ADD THE FOLLOWING:

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

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

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

DELETE THE ENTIRE CONTENTS AND REPLACE WITH THE FOLLOWING:

401.1-DESCRIPTION:

This work shall consist of constructing one or more courses of ~~hot-mix asphalt (HMA) or warm-mix asphalt (WMA)~~ asphalt concrete, 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 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 ~~HMA or WMA~~ asphalt concrete will be by the ton, square yard or cubic yard. The work will be accepted in accordance with these Specifications and the applicable requirements of Sections 105, 106, and 109.

401.2-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.

401.2.1–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

401.3-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.

401.4-COMPOSITION OF MIXTURES:

401.4.1-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.

401.4.2-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 type of ~~HMA~~ asphalt concrete to be produced. Depending on the design type, the JMF gradations shall be within the tolerances set forth in either Table 401.4.2A or Table 401.4.2B. 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. 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 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 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 401.4.2A
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 401.4.2B
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)
Standard 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 source may be changed without requiring a new mix design, but the binder grade must always remain the same for each design. 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.

401.4.2.1-Warm Mix Asphalt: When the Division allows an approved ~~HMA~~ asphalt concrete 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 401.10.3 and 401.10.4 of this specification ~~and in MP 401.05.20, Compaction Testing of HMA Pavements~~, may be waived if it can be established that additional density can be obtained at lower temperatures without damaging the pavement. Intermingling of WMA ~~and HMA~~ with non WMA materials on the same course should be avoided. If circumstances result in the need for intermingling, it must be approved by the Engineer. Upon approval, the location where intermingling occurs on the project shall be clearly defined and documented by the Contractor and submitted to the Engineer. ~~Also, i~~If the intermingling occurs on a project where the density of the pavement is being controlled by the rollerpass compaction method, then a new test section shall be established on the new material beginning at the point where the WMA and standard asphalt concrete material ~~HMA~~ meet. If the intermingling occurs on a project where the density is controlled via Lot by Lot testing, the location should be clearly marked so that the correct maximum theoretical density can be used. All testing requirements established for ~~HMA~~ standard asphalt concrete mix designs and quality assurance/quality control testing shall also apply to WMA.

401.5-TESTING:

401.5.1-Procedures:

AASHTO R 47	Reducing Samples of Asphalt Mixtures to Testing Size~~Reducing Samples of HMA To Testing Size (Quartering Method)~~
AASHTO R 68	Preparation of Asphalt Mixtures by Means of The Marshall Apparatus
AASHTO T 11	Materials Finer Than No. 200 (75 µm) Sieve in Mineral Aggregates by Washing
AASHTO T 27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T 30	Mechanical Analysis of Extracted Aggregate
AASHTO T 164	Quantitative Extraction of Asphalt Binder from HMA~~of Bitumen from Bituminous Paving Mixtures~~
AASHTO T 166	Bulk Specific Gravity (Gmb) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens~~Bulk Specific Gravity of Compacted Bituminous Mixtures~~
AASHTO T 168	Sampling Bituminous Paving Mixtures~~Sampling Hot-Mix Asphalt~~
AASHTO T 209	Maximum Specific Gravity and Density of Asphalt Mixtures~~Maximum Specific Gravity of Bituminous Paving Mixtures~~
AASHTO T 245	Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus~~Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus~~
AASHTO T 308	Asphalt Binder Content of Asphalt Mixtures by the Ignition Method ~~Asphalt Content of HMA By the Ignition Method~~ (Test Method A)
AASHTO T 312	Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor~~Determining the Density of HMA Specimens by Means of The Superpave Gyratory Compactor~~
AASHTO T 355	Standard Method of Test for In-Place Density of Asphalt Mixtures by Nuclear Methods

ASTM D5581	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (For Base-I Marshall Designs)
MP 700.00.06	Aggregate Sampling Procedures

401.6-CONTRACTORS QUALITY CONTROL:

401.6.1-Quality Control Testing: Quality control of bituminous asphalt 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.~~

The Contractor, shall design a workable Quality Control Plan, detailing the type and frequency of sampling and testing deemed necessary to measure and control the magnitude of the various properties of the asphalt governed by these specifications. This plan, prepared in accordance with MP 401.03.50 shall be submitted to the Engineer for review prior to production of material under this specification.

401.6.2-Job Mix Formula (JMF) Field Verification: For each JMF, a mix design field verification shall be conducted during the first days of plant production. For Marshall designs, the verification shall be in accordance with the guidelines established in MP 401.02.27. For Superpave, designs it shall be in accordance with MP 401.02.29. The field verification is for the purpose of demonstrating that the JMF can be produced within the specified tolerances set forth in the MP. If the mix cannot be ~~produce~~ produced within these requirements, a new mix design will be required.

401.6.3-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 401.02.27 for Marshall designs and MP 401.02.29 for 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.

401.6.4-Compaction: Projects shall be tested for compaction in accordance with the Lot-by-Lot test method described in Section 401.6.4.2 if the project limits meet all ~~four~~ of the following requirements:

1. Measured roadway width greater than 16 feet
2. Total design overlay thickness of pavement greater than or equal to 1.5 inches.
3. ~~Total average daily traffic (ADT) greater than 500.~~
4. ~~4.~~3. Total projects length greater than or equal to 0.5 miles, excluding skip paving.

If a project does not meet the above criteria, testing for compaction shall be in accordance with the Rollerpass test method described in Section 401.6.4.32.

In addition, areas of Trench Paving, Pavement Widening, and Pavement Repairs shall be tested in accordance with the Rollerpass test method or to the satisfaction of the Engineer.

When asphalt is placed in areas that require a non-uniform thickness and tapers to a thin edge including patch and level and scratch, acceptance testing of the material is not required. Compaction shall be accomplished with a minimum of eight (8) roller passes prior to reaching the temperature specified in section 401.10.4. A pass shall be defined as the entire roller traversing a spot on the pavement. Compaction shall be performed by a three-wheel (steel) roller or pneumatic-tire roller.

Acceptance testing is not required on areas which are too narrow to be compacted with the roller use for the mainline paving, as defined in the contractor's QC plan; such areas shall be compacted to the satisfaction of the Engineer.

401.6.4.1-Density Testing: All Gauge standardization procedures, calibration procedures and all Density testing conducted shall be in accordance with AASHTO T-355 - *Standard Method of Test for In-Place Density of Asphalt Mixtures by Nuclear Methods.* Testing shall be conducted in the backscatter position and follow the AASHTO Procedure with the exception that no gauge rotation will be required. All gauge tests shall be conducted with the source end of the gauge in the direction of paving. The Gauges used for both QC and QA, shall also have a gauge comparison tested as prescribed in section 401.6.4.1.1.

401.6.4.1.1-Gauge Comparison: For purposes of an accurate comparison, nuclear gauges used for QC and QA shall be compared using the following procedure. If an alternate gauge is brought to the project, repeat the following procedure. Note, this process is required for informational purposes however density readings for Acceptance testing will not be adjusted to compensate for any differences in readings between gauges. The gauge used for the Contractor's quality control testing shallould be compared with the gauge used for the Division's verification testing at the same locations.

1. The gauge used for the Contractor's quality control testing should be compared with the gauge used for the Division's verification testing.
2.1. Standardize both gauges according to AASHTO T 355.
3. Place the aluminum plate provided by the Division on the standard block used for verification testing. Place the standard block on material weighing a minimum of 110lb/ft^3. The block must not be near metal or other objects during testing and must not be moved. Keep the gauges separated a minimum of 30 feet during testing.
2. Take five (5) one-minute wet density readings with each gauge in the backscatter position at three randomly located positions within the initial 500 feet of paving.
    a. Locations shall be at least 100ft from the initial construction joint and a minimum of 1 foot from the edge of the pavement.
3. The range of the five readings at each location shall not exceed 25 kg/m^3. If the readings exceed this range, perform a new set of five readings. A gauge should not be used if the repeatability of the gauge is not within this range.
4. Utilize the average of the 15 readings to note the difference between the gauges to

be used for QC and QA. The Contractor shall take note of this difference whilst performing QC testing. All documentation shall consist of original wet density readings as shown on the gauge, no offset is permitted to be entered into the gauge.

a. Difference = QA Gauge – QC Gauge [note sign]

4. ~~Take five~~ ten (~~5~~10) ~~one-minute wet density readings with each gauge in the backscatter position~~ and record the wet density readings exactly as shown on the ~~gauge. The gauges are to be oriented on the block the same as for standardization. Record the wet density readings exactly as shown on the gauge~~Location of the ten ~~reading are selected in the following manner.~~
   - ~~Locate the testing location randomly within the first 250 feet of paving, excluding the first 50 feet and a minimum of 10 feet from any area requiring handwork, i.e., manholes, inlets..~~
   - ~~Take five (5) readings at the location moving transversely across the roadway. Take readings at the following offsets from the centerline: 1, 3, 7, 9, 11 feet. If the paving width exceeds 12 feet, divide the offset locations evenly~~
   - ~~Take an additional five (5) readings at the 5-foot offset position.~~
   - ~~If the roadway is narrower than the given offset locations adjust accordingly, test a minimum of four (4) offsets locations.~~
   - ~~If paving width exceeds 12 feet, take readings at 1-foot from each edge and divide the remining transverse footage evenly for the remaining 4 locations. The 5-foot offset position shall still be utilized as described in c.~~
5. ~~The range of the five readings~~ located at the five-foot offset ~~shall not exceed 241.5 lb~~kg/ft^3~~m^3~~. ~~If the readings exceed this range, perform a new set of five readings. A gauge should not be used if the repeatability of the gauge is not within this range.~~
6. ~~Average the five readings for each gauge. The gauges are considered similar if the averages of the readings are within 3 75 kg/m^{3}lb/ft^3.~~
7. ~~.The density readings for verification testing will not be adjusted to compensate for any differences in readings between gauges.~~

~~**401.6.4.1.2 Thin Lift Correction:** A Thin Lift Correction shall be performed on the existing pavement layer, in the state at which it will be paved. Density readings for the Correction shall be taken prior to paving. The correction shall be calculated as described in the operations manual of the testing device. The Thin Lift Correction shall be established as described below:~~

~~Lot-By-Lot: Ten randomly located tests within the initial 1,500 feet. The average of the ten tests shall be used as the underlying density in the correction equation. These values shall be recorded on the thin lift correction testing form. A new thin lift correction shall be completed if the existing pavement changes, e.g. milled, unmilled, scratch, concrete.~~

~~Rollerpass: Five randomly located tests within the initial area of paving for the day or wherever a new Rollerpass is to be established. These five tests shall be conducted within a 400-foot section, the average shall be used as the underlying density in the correction equation. These values shall be recorded on the thin lift correction testing form. This section shall begin 100 feet beyond the transverse joint, or immediately when a new Rollerpass is to be conducted.~~

401.6.4.2-Lot-by-Lot Testing: Density of the traveled lanes, shoulders, and Longitudinal Joint will be accepted in the field on a lot by lot basis. Lots will be established cumulatively and will be specific for each JMF. A normal lot size shall not exceed 1000 linear feet of paving, unless operational conditions or project size dictates otherwise. Each lot shall consist of five equal sublots. A standard sublot shall be 200 linear feet. Sublots shall be tested with randomly located nuclear density tests. ~~, tests shall utilize the Thin Lift Correction as described in 401.6.4.1.2.~~

~~A normal lot size shall not exceed 1500 linear feet of paving with five, 300 linear foot sublots, unless operational conditions or project size dictates otherwise.~~ If the remaining footage of the final two lots of a project combine to be less than 2000 linear feet following the following:

1. If the length is greater than 1000 feet but less than or equal to 1500 feet combine length into a single lot and, divide its length into five equal sublots;
2. If the remaining length is greater than 1500 feet and less than 2000 feet, divide the length into two equal lots with five equal sublots in each lot.

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. Relative density shall be calculated based on the Maximum Specific gravity from the Division approved JMF or the Maximum Specific Gravity established under section 401.6.2, Job Mix Formula Verification, whichever is more recently established.

401.6.4.2.1-Mat Density: Compaction testing for the mat density shall be performed for all traveled lanes and shoulders and will be evaluated based on an Upper Specification Limit (USL) of 97.0% relative density and a Lower Specification Limit (LSL) of 93~~2~~.0% relative density. The average mat density of the Lot shall be calculated as the average of the sublot results. Acceptance of Mat Density shall be in accordance with Section 401.13.3.

401.6.4.2.2-Joint Density: Longitudinal joint density testing shall be performed on all constructed joints between traveled lanes. Testing of a ~~A~~ longitudinal joint~~s~~ constructed between a travel lane and a shoulder ~~will~~ is not required ~~testing~~. Joint density testing is not required until both lanes of the joint are constructed. The first lane constructed shall be referred to as the cold side and the second lane shall be referred to as the hot side. Joint density testing shall be conducted on the hot side, with the gauge positioned four inches from the constructed joint. Only longitudinal joints constructed on the surface course shall be subject to density testing.

Longitudinal joint density testing shall be accepted in the field on a lot by lot basis as described in Section 401.6.4.1. Compaction testing for the joint density will be evaluated based on an Upper Specification Limit (USL) of 97.0% relative density and a Lower Specification Limit (LSL) of 90.0% relative density. The average joint density of the Lot shall be calculated as the average of the sublot results. Acceptance of joint density shall be in accordance with Section 401.13.3.

401.6.4.3-Roller Pass Testing: A Rollerpass Control Section shall be completed on a daily basis, when roadway conditions change where they would affect the compaction effort, or when the Engineer determines the current rollerpass is unsatisfactory. ~~The~~ A

rollerpass shall be established prior to the mat reaching the temperature specified in section 401.10.4. ~~and~~

If a project does not meet the criteria in section 401.6.4, testing for compaction shall be in accordance with the rollerpass test method described in Section 401.6.4.2.

In addition, areas of trench paving, pavement widening, and pavement repairs shall be tested in accordance with the rollerpass test method or to the satisfaction of the Engineer. A rollerpass shall be conducted in the following manor:

1. The ~~Control~~ Rollerpass Control Section shall be conducted ~~within the first~~ 100 feet beyond the initial transverse construction joint.~~, or~~ If an additional rollerpass is required by the Engineer conduct it immediately ~~when a new Rollerpass is to be conducted~~. ~~Follow section 401.6.4.1.2 to establish a Thin Lift correction factor.~~
2. Apply four passes with the breakdown roller (a pass shall be defined as the entire roller traversing a spot on the pavement) to the roadway, then conduct two randomly located nuclear density testing within the section; record the results, the average, and the mat temperature at each test location.
3. Apply an additional two passes and repeat the nuclear density testing in the same locations; record the results, the average, and the mat temperature at each test location.
4. Repeat step 3 until one or more of the following conditions occur: (a) less than 5 kg/m^3 increase occurs between the average of two sets of readings, (b) the density of the material exceeds 97.0% Gmm,~~ or~~ (c) one of the two test location "breaks over" (i.e. shows a decrease in density) after exceeding 92.0% of Gmm, or (d) the temperature of the mat has fallen below 175 °F.
5. Compute the Percent of Gmm using the average of the two readings and record on the worksheet~~ using the thin lift correction~~.

If the mat begins to show signs of distress (such as excessive surface aggregate breakage or mat cracking) before reaching 175 °F, then discontinue rolling and record the number of roller passes completed before the stress signs occurred. If a tender mix, as defined in Section 3.3, is encountered the Contractor may be allowed to continue rolling at lower temperatures if it can be demonstrated that additional densification can be achieved at a lower temperature without causing any pavement distress.

Once the control section is completed, the ~~Thin Lift corrected~~ density shall be equal to or greater than 92.0% of Gmm. If the ~~thin lift corrected~~ density does not meet 92% of Gmm, repeat the procedure above immediately. If after two control sections the density still does not meet 92% of Gmm, contractor shall apply the number of passes associated with the highest percent density, minimum of 8 passes, unless the Engineer determines more appropriate means. To help with this decision, an evaluation may be made of the existing pavement condition and any density test results obtained prior to construction of the test section will be reviewed.

If the ~~thin lift corrected~~ density within the control section me~~e~~ets 92% of Gmm conduct a proving section in the proceeding ~~200~~ 1000 feet. Within the proving section, apply the established number of passes and conduct ~~ten~~ five randomly located nuclear density tests. The average of these ~~ten~~ five tests shall exceed a minimum density of ~~-~~92% Gmm and be within ±50~~34~~.0 kg/m^3 of the average wet density determined in the Rollerpass control

section. If this is not achieved a new ~~test~~ rollerpass section shall be conducted.

All data shall be submitted the Engineer on associated Rollerpass forms.

401.7-VERIFICATION TESTING:

401.7.1-Acceptance Testing of ~~HMA~~Asphalt Concrete: Acceptance testing of asphalt is the responsibility of the Division. For Superpave mixes, the acceptance sampling and testing requirements for the mixture shall be as set forth in MP 401.02.29.

401.7.2-Surface Tolerance: Final smoothness testing of all new Asphalt surfaces shall be in accordance with Section 720.

When compaction is completed on the course, it shall present a uniform surface, true line and grade, conforming to the cross section shown on the Plans. When tested with a straightedge of approximately 10 feet in length and a template of the specified dimensions, the finished base course shall not show a deviation greater than ¼ inch and the finished wearing course shall not show a deviation from the required surface greater than 3/16 inch.

The Contractor shall provide the straightedge and template for checking the surfaces and an employee to use them under the direction of the Engineer. Any irregularity of the surface exceeding the limits specified shall be corrected. Depressions which develop after the initial rolling shall be corrected by loosening the mixture and adding new material. High places shall be corrected by removing excess material.

Areas of completed courses found to be defective shall be removed and replaced with approved mixtures laid in accordance with these specifications, and no additional compensation will be allowed for materials used or work involved in replacing defective areas.

401.7.3-Lot by Lot Compaction: ~~Verification~~Acceptance testing of mat and joint density is the responsibility of the Division. The Division will conduct density ~~verification~~ acceptance testing in accordance with section 401.6.4.1. ~~Verification~~ Acceptance activities will be accomplished by conducting testing completely independent of the quality control activities.

401.7.3.1-Mat Density:- Within a lot of materials offered by the contractor for acceptance, locate one random test. Perform a single 1-minute test in accordance with section 401.6.4.1. Compare the density to the specification range. If the value is within the range, the lot is accepted for density. If the density result is outside the specification range, divide the lot into five equal sublots and randomly locate a test site within each sublot. Average the five sublot results and utilize section 401.13.3 to determine any required price adjustments.

~~Tests will be taken at a frequency approximately equal to two lots per eight for both mat and joint density, with a minimum of two lot evaluation for each Mat and Joint per project.~~

401.7.3.2-Joint Density: If a ~~J~~joint density lot is to be tested, it will be tested with the corresponding Mat lot. Testing of a joint density lot shall follow section 401.7.3.1.~~sublot testing of lot is not required given an acceptable~~

~~**401.7.3.1 Evaluation for Similarity:** The ten (10) verification tests taken by the Division will be statistically evaluated, using an F-test and T-test at a 95% confidence level, for statistical similarity to the Contractors ten (10) quality control tests. If the evaluation indicates that the Division's test results are statistically similar to the~~

~~Contractor's test results, then the test results represented by this evaluation will be considered acceptable, therefore shall be used in the price adjustment in accordance with section 401.13.3.~~

~~If the evaluation proves statistically not similar an investigation will be conducted to determine the cause and extent of nonsimilarity. The intent of the investigation is to define and correct any testing deficiencies that may cause a misrepresentation of the tested material. In addition, if the evaluation is statistically not similar, the Division may test additional lots and use the verification testing results for the basis of payment.~~

401.7.4-Thickness: When a uniform thickness of three inches or more is specified, excluding resurfacing, cores shall be taken to verify the thickness of the compacted pavement.

Cores will be taken by the Division at random locations. The sampling frequency shall be approximately five cores per 2,000 feet of two-lane construction, except that the sampling frequency shall normally be limited to a minimum of five and a maximum of 50 cores per project. The Division may elect to waive coring for short projects of less than 1,000 feet in length or for projects where a paving mat of uniform thickness cannot be expected (for example: tapered paving mats or pavement widening projects). The Division may also elect to take additional cores when needed to resolve problems related to pavement thickness.

The thickness shall be considered acceptable if one or both of the following criteria are met:

(a) The average thickness equals or exceeds the specified thickness.

(b) The average thickness is less than the specified thickness, but the difference is not statistically significant at the 95% confidence level. (Standard one tail "t" test at 0.05 significance).

The calculated 't' value shall be less than or equal to the standard 't' value at the 95% confidence level. The method for calculating Criteria 'B', shall be as follows:

$$t \leq t_{95}$$

Where:

t_{95} = value from standard "t" table for 95% confidence level

$$t = \frac{x_s - \bar{x}}{s}\sqrt{n-1}$$

x_s = specified thickness

$\bar{x}$ = average thickness

n = number of samples

$$s = \sqrt{\frac{\sum x_2 - \frac{(\sum x)_2}{n}}{n-1}}$$

x = individual core thickness

If the average thickness is less than specified and is determined to be significant as determined by criteria 'B', the Division shall decide on a course of action as described in Section 401.13.4.

401.8-WEATHER RESTRICTIONS:

Bituminous asphalt shall only be placed when the surface is dry and when weather conditions are such that proper handling, finishing, and compaction can be accomplished. In no case however, shall asphalt be placed when the surface temperature is below the minimum established in Table 401.8.

TABLE 401.8

Course Thickness	Minimum Surface Temperature
3 inches and over	35 °F Note 1
1.5 to 2.9 inches	40 °F
Less than 1.5 inches	50 °F

Note 1 In lieu of 35 °F, a minimum air temperature of 40 °F shall be used when paving directly on an aggregate base, subbase, or subgrade.

In addition to the above surface temperature requirements, no wearing courses shall be placed when the air temperature is less than 40° F.

401.8.1-Cold Weather Paving: When the air temperature falls below 50° F or the surface temperature falls below 60° F the provisions for cold weather paving shall apply.

Paving shall be performed so that the transverse joints in adjacent lanes shall be no more than 50 feet apart at the end of each day's paving operations.

The surface temperature shall be taken a minimum of once every hour and shall be taken in all shaded areas. The temperature requirements as listed in Table 401.8 shall apply.

It shall be the Contractor's responsibility to monitor the declining surface temperature to insure that material delivery from the plant be terminated so as to allow that all material can be placed prior to the surface temperature falling below the surface temperatures listed in Table 401.8.

The temperature of the delivered material and the mat temperature at the time final density is obtained shall be taken for every truck load. These temperatures shall be in accordance with Section 401.10.3 for delivered material and 401.10.4 for the mat temperature at the time final density is obtained.

401.9-EQUIPMENT:

401.9.1-Plants: 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. All plants shall meet the general requirements set forth in AASHTO M 156 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.

401.9.2-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.

401.9.3-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 bin.

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.

401.9.4-Test Weights: As part of its standard equipment, each plant which proportions aggregate by weight shall provide a minimum of ten 50-pound test weights for the purpose of maintaining the continued accuracy of its weighing equipment.

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

401.9.5-Surge and Storage Bins: During the normal daily operation of the plant, asphalt may be stored in a surge or storage bin for a maximum of 12 hours, provided the bin 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 401.10.3 and 401.10.4

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. An inert gas system may be used to purge the silo of oxygen to prevent oxidation of the asphalt. The asphalt delivered from the storage silo shall meet all of the specification requirements.

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.

Loading of trucks through the storage bin will only be permitted when a minimum 25-ton buffer of material is being maintained or an amount as recommended by the bin manufacturer, means shall be provided for loading the trucks directly from the mixer when the storage bin is not in operation.

401.9.6-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.

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

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.

401.9.8-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. 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. Standard Gilson shaker or equivalent, with screens.

vii. Ro-Tap shaker or equivalent, with 8 and/or 12 inch diameter screens.

viii. Sample splitters for fine and coarse aggregates.

ix. 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).

x. Expendable supplies necessary for performance of tests.

xi Equipment for determining the maximum specific gravity of asphalt mixtures as specified in AASHTO T 209.

xii. Equipment for determining the in-place density of asphalt mixtures meeting the requirements of MP 401.05.20.

xiii. Non-contact infrared thermometer accurate to ± 2° F.

xiv. Equipment for determining the bulk specific gravity of ~~HMA~~ asphalt mixtures using saturated surface dry specimens complying with AASHTO T 166.

xv. Marshall equipment necessary to comply with AASHTO R68, AASHTO T 245 and ASTM D5581, including a calibrated ~~automatic testing apparatus~~load frame having recording capabilities (digital or analog) and compaction hammers. (Marshall designs only)

xvi. Asphalt content ignition oven with built-in scale and printer meeting the requirements of AASHTO T 308, Test Method A. ~~(Optional for Marshall designs – Mandatory for Superpave designs)~~

xvii. Calibrated Gyratory compactor meeting requirement of AASHTO T 312 with computer (including software for data acquisition and test calculations) and primer. Compactor must be calibrated to the internal angle in accordance with AASHTO ~~TP~~T344~~P 71~~ with annual verification (Superpave designs only).

401.9.9-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.

401.9.10-Compaction Equipment: Compaction ~~may~~ shall be performed by self-propelled steel-wheeled or~~,~~ pneumatic-tired rollers. The use of either ~~and/or~~ vibratory or oscillatory type rollers is acceptable.~~ rollers.~~ Pneumatic rollers shall ~~have~~be equipped with skirting around the wheel area to prevent heat loss to the tires and tire ~~. Pneumatic roller tires shall be equipped with~~ pads. Hand-held rollers or vibrating plates may be used in small inaccessible areas ~~if~~ as approved by the Engineer. Prior to use on any project, the roller shall be inspected to see that it is in good mechanical condition. The total weight, weight per inch of width (steel-wheeled), and average ground contact pressure (pneumatic-tired) shall be documented in the contractors QCP in accordance with MP 401.

401.10-PAVING OPERATIONS:

401.10.1-Cleaning and Sweeping: Immediately prior to the arrival of the paving mixture, the existing base or surface shall be thoroughly cleaned by the use of tools and equipment as may be required to remove all mud, dirt, dust, and other caked or loose material foreign to the type of treatment or surface being placed. The cleaning shall be done to a minimum width of one foot on each side beyond the width of the surface being placed.

401.10.2-Patching and Leveling and Scratch Courses: Compaction of patching and leveling and Scratch Courses shall be performed with three-wheel (steel) or pneumatic-tire rollers.

401.10.2.1-Patching and Leveling: A tack coat shall be applied to the existing pavement prior to placing patching and leveling.

Patching and leveling shall be placed at various locations throughout the project to remove irregularities in the existing pavement such as dips, or to raise the outside edge of the existing pavement to provide a uniform template prior to placing a base or wearing course. Patching and leveling shall not be placed as a continuous layer or course over the full width and length of the project.

~~Compaction of patching and leveling shall be performed with three-wheel (steel) or pneumatic-tire rollers.~~

401.10.2.2-Scratch Course: A tack coat shall be applied to the existing pavement prior to placing a scratch course.

~~—~~The scratch course shall be placed to the limits designated on the plans. Scratch course shall be placed with a paving machine. The paving machine screed shall be set to drag on the high areas of the existing pavement, only depositing material in ruts and other depressions.

~~—~~The wearing course, or at least one lift of base course, should be placed over the scratch course prior to maintaining traffic in the lane where the scratch course has been placed. All repairs to a scratch course due to traffic damage shall be at the contractor’s expense.

~~Compaction of a scratch course shall be performed with a three-wheel (steel) or pneumatic-tire roller.~~

401.10.3-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 mixes produced with neat (non-modified) asphalts (which may include PG64H-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 within the master temperature range of 250° and 338°F unless otherwise specified by the asphalt supplier. The mix temperature shall be monitored by inserting a dial type 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 of the weather restrictions of Table 401.8, the mix temperature may be increased up to a maximum of 338°F 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, which will be referenced on the JMF.

401.10.4-Rolling Procedure: Shoulders, ramps, and similar areas shall be compacted in the same method as the mainline.

During rolling, roller wheels shall be kept moist with only enough water to avoid picking up material. Fuel oil on roller wheels or pneumatic tires is not allowed. Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver.

If rolling causes material displacement, the affected area shall be loosened at once with lutes or rakes and restored to its original grade with loose material before being re-rolled. Heavy equipment, including rollers, should not be permitted to stand on the finished surface before it has thoroughly cooled or set.

Mat temperature shall be measured using a non-contact infrared thermometer. The required density shall be obtained prior to the mat temperature reaching 175° F. The

Contractor shall be allowed to lower this temperature to 165° F if they can demonstrate during the first day of placement of each lift on each project that additional densification can be achieved without causing any pavement distress.

401.10.5-Joints: The longitudinal joint in any layer shall offset that in the layer immediately below by approximately six inches; however, the joint in the top layer shall be at the centerline of the pavement if the roadway comprises two lanes of the width, or at lane lines if the roadway is more than two lanes in width. The transverse joint in any layer shall offset that in the layer immediately below by approximately six feet.

All transverse joints between existing and new pavement shall be "heeled-in" to the existing surface at the beginning and at the end of the project and at all other locations where the new pavement terminates against an existing pavement. Transverse joints between one day's production and the next shall be carefully constructed and shall be formed by cutting back into the existing section to expose the full depth of the course. All joints shall be squared up to the full vertical depth of the course to be placed, and a tack coat of asphalt material shall be applied. Joints adjacent to curbs, gutters, or adjoining pavement shall be formed by transporting back sufficient hot material to fill any space left uncovered by the paver.

The longitudinal joint between adjacent mats shall be set up to a sufficient height to receive the full compactive effort from the rollers and shall be tacked prior to placing adjacent material.

Transverse joints shall be checked for smoothness with a ten foot straight edge provided by the Contractor. All surface irregularities shall be corrected prior to proceeding with paving operations.

401.10.6-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.

401.11-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 636: Maintaining Traffic shall apply.

401.12-METHOD OF MEASUREMENT:

Asphalt concrete will be measured by the ton, or square yard. For projects paid by the ton, the quantity will be determined by the Contractor from the total weigh slips for each vehicle

load weighed upon an approved standard scale or from digital printout slips from an automatic batching plant, and certified by the Contractor as correct. For projects paid by the square yard, the quantity will be determined by the Plan Quantity as provided for in the proposal unless otherwise directed by the Engineer.

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.

No additional measurement is necessary nor will addition compensation be allowed for the placement of Safety Edge.

401.13-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, and incidentals necessary to complete the work.

The conditioning, cleaning, and sweeping of the existing base or underlying surface shall be considered as part of the construction of the appropriate items listed in 401.14, and no additional compensation will be allowed for "Cleaning and Sweeping".

There will be no additional compensation for tack coat material used for minor (spot) areas to be patched and leveled; the cost of this tack coat material will be included in the unit bid price for the “patching and leveling” Item.

There will be no additional compensation for Interim Pavement Markings.

401.13.1-When a Lot of ~~Superpave~~ asphalt material is found not in compliance with the tolerance requirements of MP 401.02.~~29~~27 or MP 401.02.29, it shall be subject to a price adjustment in accordance with the criteria established in this MP.

~~**401.13.2** When a Lot of asphalt pavement is represented by a smoothness value larger than that shown in Tables 401.7.2, the unit price of the Lot (surface course only) shall be determined as follows:~~

~~ENGLISH VERSION:~~

~~Reduced Unit Price = Unit Bid Price X [(127.86 – As)/100]~~
~~Where A = 0.429 when specified smoothness is 65 in/mi~~
~~Where A = 0.341 when specified smoothness is 81 in/mi~~
~~Where s = Smoothness value measured as per 401.7.2~~

~~When the measured smoothness value exceeds the specified value by 50% or more, the Lot so measured shall be corrected, at the Contractor’s expense, to comply with Tables 401.7.2.~~

401.13.3-A Lot of asphalt pavement shall have its price be adjusted in accordance with Table 401.13.3A using Formula-1. If a Lot of asphalt pavement is associated with a Longitudinal Joint Lot its price shall be adjusted in accordance with Table 401.13.3A and Table 401.13.3B using Formula-2. The longitudinal joint density determined in accordance with Section 401.6.4 shall represent the Lot on which the joint density testing was performed.

Any price adjustment for joint density shall be applied to that Lot only.

Use Formula-1 on the first lane paved before a longitudinal joint is constructed. Use Formula-2 when both mat and joint density testing is required on a project.

FORMULA-1: Lots requiring only mat density testing:

Lot Price Adjustment (Mat only) = (unit price) X (Lot quantity) X (mat density price adjustment % from Table 401.13.3A)

FORMULA-2: Lots requiring both mat and joint density testing:

Lot Price Adjustment (Mat + Joint) = (unit price) X (Lot quantity) X [(mat density price adjustment % from Table 401.13.3A) + (joint density price adjustment % from Table 401.13.3B)]

TABLE 401.13.3A

Adjustment of Contract Price for Pavement Mat Density	
Percent of Density	Percent of Contract Price to be Paid
Greater than 97 %	Note 1
~~95%~~ 93% to 97%	~~102~~ 100
~~92% to 94%~~ 92%	~~100~~ 99
88~~91~~% to 91~~88~~%	= ~~100~~ 99 – 4*(92% - Percent density)
Less than 88%	= ~~82~~ 84 – 10*(88% - Percent density) Note 2

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

Note 2: When the density is less than ~~92%~~ 93%, 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.

TABLE 401.13.3B

Adjustment of Contract Price for Pavement Joint Density	
Percent of Joint Density	Percent Adjustment
Greater than 97 %	Note-3
~~94 % to 97 %~~	~~+2.0%~~
~~92% to 93%~~	~~+1.0~~
90% to 9~~7~~1% Note 4	0%
89 % Note 5	-1.0%

TABLE 401.13.3B

Adjustment of Contract Price for Pavement Joint Density	
Percent of Joint Density	Percent Adjustment
88 % Note 5	-3.0%
Less than 88 %	Note 5 and 6

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

Note 4: If the longitudinal joint density is determined to be less than 92% on 25% or more of the total project LOTs, then the Contractor shall be required to seal the joint a minimum of 3" on each side of the joint with a heated PG 64S-22 binder (or approved equivalent) on the entire project at no additional cost to the Division.

Note 5: Any longitudinal joint densities determined to be below 90% the Contractor shall be required to seal the joint a minimum of 3" on each side of the joint on the entire project with a heated PG 64S-22 binder (or approved equivalent) at no additional cost to the Division

Note 6: Density values less than the minimum specified 90% will be more susceptible to accelerated deterioration of both the joint and the surrounding pavement. For Joint densities less than 88%, the percent of adjustment will be decreased by an additional 6% per percentage of joint density less than 88%, unless a Special evaluation performed by the Division determines a more appropriate action.

401.13.4-When a Lot of asphalt pavement is determined to be statistically non-conforming in accordance with Criteria 'B' of Section 401.7.4, the Division will review the plans and project records to determine if there is an acceptable explanation for this deficiency. If it is determined that a deficiency does exist, one of the following adjustments may be used. If the deficiency is less than ¾ inch, the Division may choose to accept the material at a price equal to the bid price times the ratio of the average thickness divided by the specified thickness. If the deficiency is ¾ inch or greater, the Division may require that an additional lift of material [specified to the nearest ¼ inch of the deficiency] be placed at the Contractor's expense. Retesting of the overlay will be at the expense of the Contractor in accordance with MP 109.00.20.

401.14-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
401001-*	"design method" Asphalt Base Course, "aggregate type", Type "mix type"	Ton
401002-*	"design method" Asphalt Wearing Course, "aggregate type", Type "mix type"	Ton
401003-*	"design method" Asphalt Patching And Leveling Course, "aggregate type	Ton
401007-*	"design method" Asphalt Scratch Course, "aggregate type", Type 'mixed type"	Ton
401017-*	Asphalt Pothole Repair, Type	Ton

* Sequence number
"design method" shall be either Marshall or Superpave
"aggregate type" shall be either stone and gravel or slag
"mix type" from Table 401.4.2A or 401.4.2B

May 25, 2022

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 623
PNEUMATICALLY APPLIED MORTAR OR CONCRETE (SHOTCRETE)

623.2-MATERIALS:

DELETE THE PARAGRAPH AND TABLE AT THE END OF THE SUBSECTION AND REPLACE THE FOLLOWING:

The aggregate gradation shall comply with the requirements of Table 623.2.

TABLE 623.2

Column 1	Column 2	Column 3
Sieve Size	**Allowable Percent by Mass Passing Each Individual Sieve in Mix Design**	**Allowable Mix Design Tolerance During Production[Note1]**
½ inch (12.5 mm)	100	± 0%
⅜ inch (9.5 mm)	90-100	± 3%
No. 4 (4.75 mm)	70-85	± 3%
No. 8 (2.36 mm)	50-70	± 3%
No. 16 (1.18 mm)	35-55	± 3%
No. 30 (600 µm)	20-35	± 3%
No. 50 (300 µm)	8-20	± 2%
No. 100 (150 µm)	2-10	± 2%
Note 1	The maximum and minimum ranges of the allowable % by mass passing on each sieve size noted in Column 2 of Table 623.2 shall not be exceeded during production while using the tolerances in Column 3 of Table 623.2.	

623.6-TESTING DURING CONSTRUCTION:

ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

623.6.5-Combined Aggregate Gradation: The aggregate gradation shall be performed by the contractor once for every 50 cubic yards of shotcrete that is produced from the same mix design. The aggregate gradation shall meet the requirements of Table 623.2 and be within

the allowable design mix tolerance of the approved mix design. However, not more than one aggregate gradation test (for each mix design) shall be required per calendar day as long as not more than 400 cubic yards of shotcrete is produced in a single day from the same mix design.

In situations when more than 400 cubic yards of shotcrete is produced in a single day from the same mix design, two aggregate gradation tests shall be required (one in the AM and one in the PM) for that mix design. During any calendar week (Sunday through Saturday) in which shotcrete is being produced, a minimum of one aggregate gradation test shall be required (for each mix design from which shotcrete is being produced). This aggregate gradation test shall be conducted on the first day of production of that calendar week.

Should the moving average of any five consecutive aggregate gradation tests have a result for any of the sieve sizes listed outside of the limits set forth in the gradation of the original mix design with the production tolerances of Column 3 on Table 623.2, production shall be discontinued until appropriate corrections are made. Corrections shall be made either in the aggregate proportions in the shotcrete mix (the mix design), the gradation of the aggregates, or the storage and loading of the aggregate, as the Contractor may elect.

When the small quantity work condition applies, the aggregate gradation test required after 50 cubic yards of shotcrete production shall be performed on the day that the 50 cubic yard quantity is achieved. All shotcrete produced on that day (the day that the 50 cubic yard quantity is achieved) shall be represented by the previous aggregate aggradation test. The aggregate gradation test conducted on the day that the 50 cubic yard quantity is achieved shall represent the next 50 cubic yards of shotcrete produced, beginning with the shotcrete produced on the next day of production.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATION

FOR

SECTION 661
TRAFFIC SIGNS AND DELINEATORS

661.2-MATERIALS:

661.2.3-Retroreflective Sheeting and Matched Components:

DELETE PARAGRAPH TWO AND REPLACE WITH THE FOLLOWING:

Fluorescent-yellow Type ASTM-XI sheeting shall be used when fabricating the following signs: W1-6 through W1-8, all 48-inch diamond W Series, all barrier wall mounted 36-inch diamond W Series dual installed with a shoulder mounted 48-inch diamond W Series along freeways or expressways, all W Series supplemental plaques installed below ~~a 48-inch~~ fluorescent yellow diamond W Series, all XR Series, all XS Series, all yellow panels of extruded panel signs, any yellow flat sheet sign attached to a yellow extruded panel sign background, and any other signs designated in the Plans to have a fluorescent-yellow background.